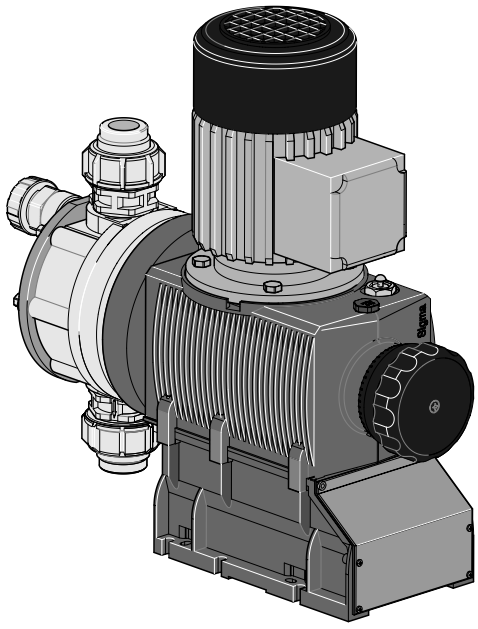
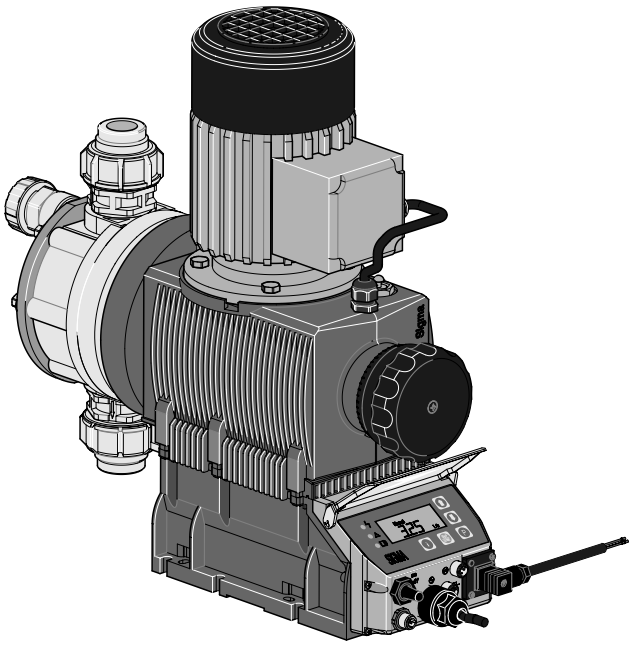
Version 10.03

Operating Instructions

ProMinent® Sigma/ 2
S2Ba (Basic Type)
S2Ca (Control Type)



S2Ba



S2Ca

S2Ba ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

S2Ca ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

Please enter the identity code of the device here.

Two sets of operating instructions are necessary to ensure the ProMinent® Sigma/ 2 S2Ba or S2Ca metering pumps are operated safely and reliably for their intended purpose:

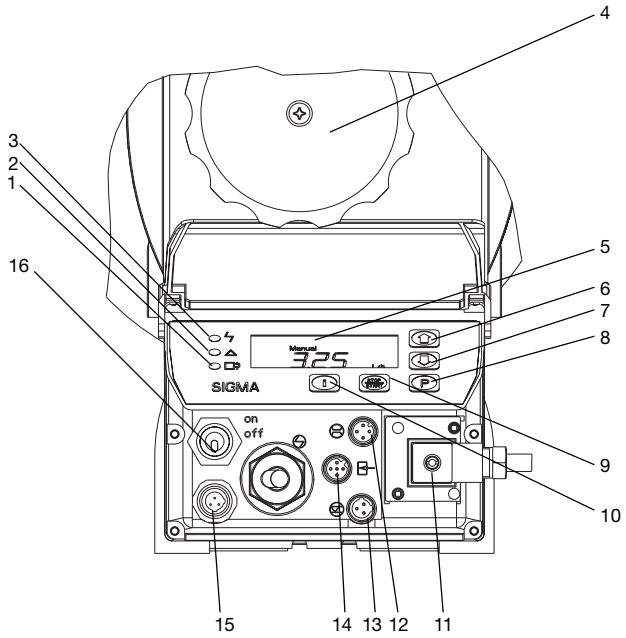
This product specific Sigma/ 2 operating instructions manual and the "General operating instructions ProMinent® motor-driven metering pumps and hydraulic accessories" are only valid if read together!

Please completely read through these operating instructions first! · Do not discard!

The warranty shall be invalidated by damage caused by operating errors!

Control elements and key functions

Control elements: overview

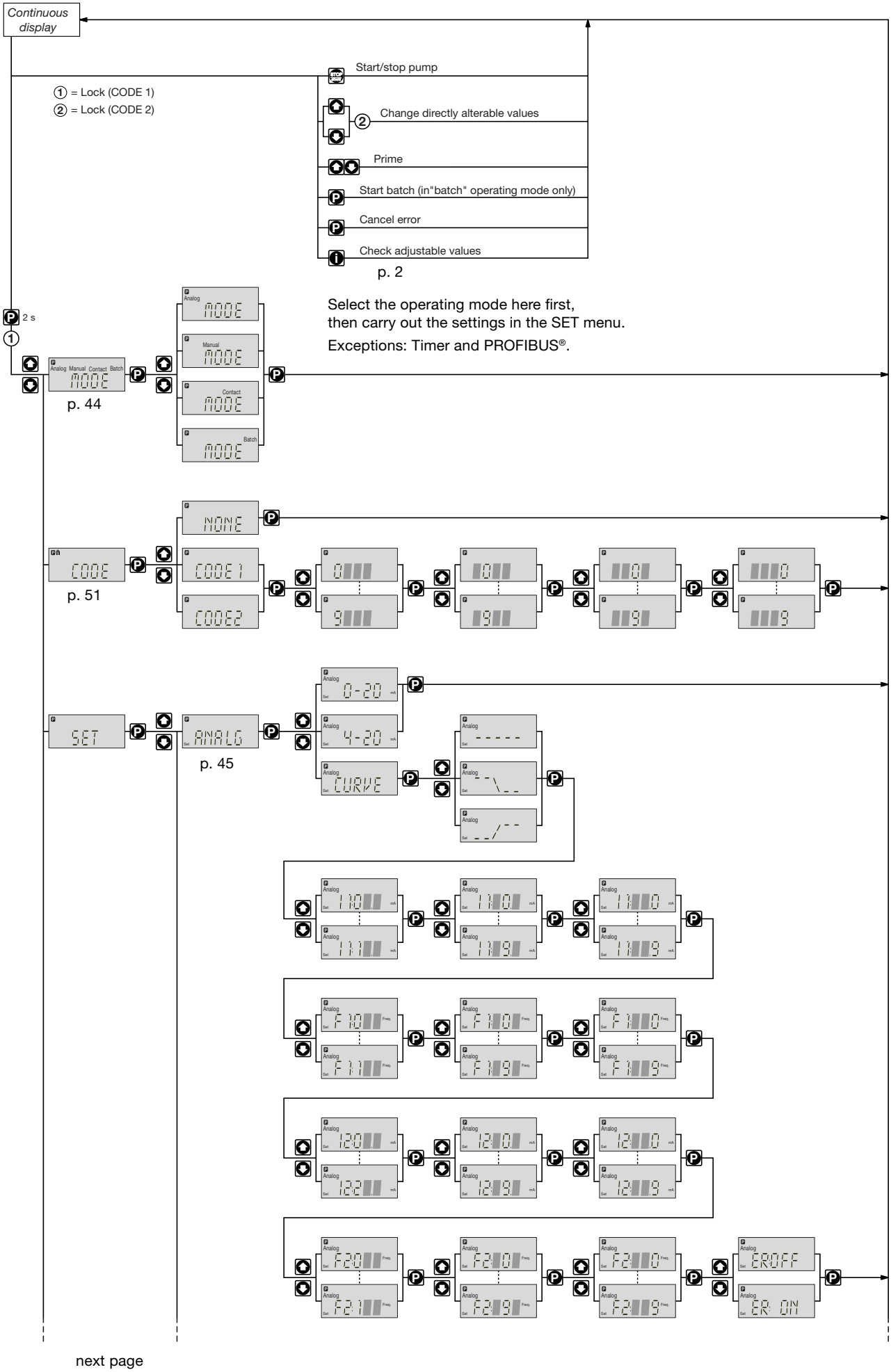


1 Operating light (green)
2 Warning light (yellow)
3 Error warning light (red)
4 Stroke length adjuster
5 LCD display
6 UP key
7 DOWN key
8 P key
9 STOP/START key
10 i key
11 Relay output (optional)
12 Metering monitor socket
13 Float switch socket
14 External control socket
15 Diaphragm rupture indicator socket
16 Mains switch

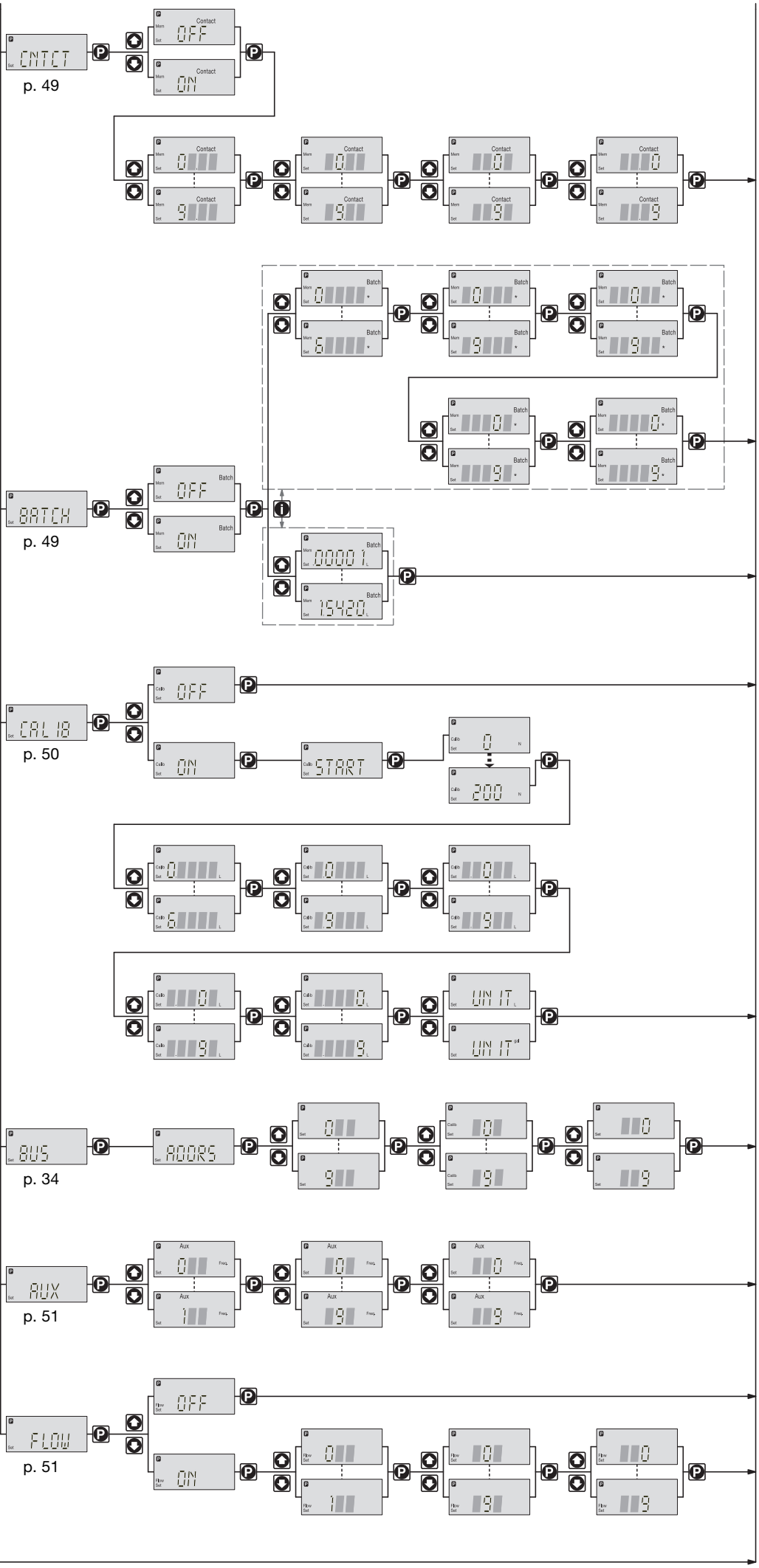
Key functions

	In continuous display mode (operating)	**In settings mode (settings)**
STOP/START key		
Press briefly	*Stop pump, start pump*	*Stop pump, start pump*
P key		
Press briefly	*Start batch (in "batch" operating mode only), Cancel error*	*Confirm entry- jump to next menu option or continuous display*
Press for 2 s	*Change to settings mode*	---
Press for 3 s	---	*Jump to continuous display*
Press for 10 s	*Software version displayed*	
Press for 15 s	*Load factory settings (calibration)*	---
i key		
Press x1	*Toggle between continuous displays*	*Toggle between "change individual digits" and change a figure*"
Press x2	---	*For "change individual digits": jumps to first digit*
Arrow keys UP and DOWN		
Press separately (until "Set" appears)	*Change directly alterable values*	*Select other settings, change individual digit or figure*
Press simultaneously	*Prime (in "stroke rate" permanent display)*	---

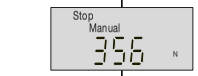
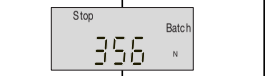
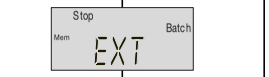
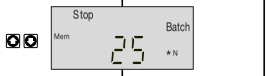
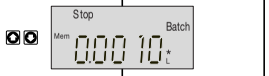
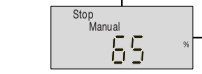
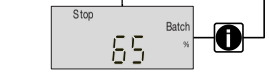
Operating-/Settings Diagram



previous page



Continuous display

Continuous display	Operating mode "**Analog**" 0-20 mA	Operating mode "**Manual**"	Operating mode **"Contact"** with memory and transfer factor 5	Operating mode **"Batch"** with memory and transfer factor 5
Stroke rate				
Feed rate				
Total stroke number				
Total litres (feed quantity)				
"External" display				
Signal current				
Strokes remaining				
Batch size/ Litres remaining				
Factor				
Stroke length				

⏣⏣ = UP and/or DOWN arrow keys, directly alterable values

"Mem" appears only when "memory" function activated

Imprint

Operating Instructions for ProMinent® Sigma/ 2 S2Ba/S2Ca
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Subject to technical modifications.

		Page
	Device Identification/Identcode	9
1	**Notes on safety of ProMinent® metering pumps**	11
1.1	Summary of additional safety instructions for the EX version of the pump (in accordance with ATEX)	11
1.2	General notes	13
1.3	Notes on installation, start-up and operation	13
1.4	Notes on maintenance and repair	14
2	**Product description S2Ba/S2Ca**	15
2.1	Identification of pump type	15
2.2	Design/Functional description	15
2.2.1	Functional description, drive	15
2.2.2	Stroke movement	16
2.2.3	Metering capacity diagram	17
2.2.4	Functional description, delivery unit	19
2.2.5	Integrated overflow valve with bleeder function	20
2.2.6	Diaphragm rupture sensor	22
3	**Technical data**	25
3.1	Technical data Sigma/ 2	25
3.1.1	Capacity data	25
3.1.2	Dimensions Sigma/ 2	27
3.1.3	Dimensions Sigma/ 2 with stroke adjustment motor	27
3.1.4	Motor data	28
3.1.5	Stroke actuator drive mechanism	28
3.1.6	Stroke adjuster drive mechanism	28
3.1.7	Electrical data, stroke sensor “Sigma”	28
3.1.8	Electrical data, pacing relay “Sigma”	29
3.1.9	Sound intensity level	29
4	**Start-up/Maintenance**	30
4.1	Start-up	30
4.2	Maintenance	30
4.3	Replacement of wearing parts	31
5	**Features of the S2Ca metering pumps**	33
5.1	Function description, motors	33
5.2	Function description, controller	33
5.3	Sockets, symbols and wiring diagram	35
5.4	Retrofitting relays	41

6	**Control elements**	42
7	**Settings**	43
7.1.	Check adjustable values	44
7.2	Change to settings mode	44
7.3	Select operating mode (MODE menu)	44
7.4	Settings for operating mode (SET menu)	45
7.4.1	Settings for “manual” operating mode	45
7.4.2	Settings for “analogue” operating mode (ANALG menu)	45
7.4.3	Settings for “contact” operating mode (CONTCT menu)	47
7.4.4	Settings for “batch” operating mode (BATCH menu)	49
7.5	Settings for programmable functions (SET menu)	50
7.5.1	Settings for “calibration” function (CALIB menu)	50
7.5.2	Settings for “auxiliary frequency” function (AUX menu)	51
7.5.3	Settings for the “flow” function (FLOW menu)	51
7.6	Setting code (CODE menu)	51
7.7	Cancel total stroke number or total litres (CLEAR window)	51
8	**Operating**	52
8.1	Manual operation	52
8.2	Remote control	53
9	**Troubleshooting**	53
10	**Decommissioning and disposal**	55
11	**Spare parts and accessories**	56
Annex		57
Motor data sheet		57
EC Declaration of Conformity		58
Exploded diagrams of liquid ends		59
Stroke actuator wiring diagram		63
Wiring diagram, stroke length adjuster		63

Identcode ordering system

Please enter the identcode on the device label into the grey box below.

S2Ba | **Sigma Basic Type (S2Ba)**

HM | Main drive, diaphragm

Pump type: (figures 1+2 = back pressure [bar], figures 3-5 = feed rate [l/h])

16050	16 bar; 50 l/h
16090	16 bar; 90 l/h
16130	16 bar; 130 l/h
12050*	10 bar; 48 l/h
12090*	10 bar; 86 l/h
12030*	10 bar; 125 l/h
07120	7 bar; 120 l/h
07220	7 bar; 220 l/h
04350	4 bar; 350 l/h * for SST versions, max. 12 bar

Liquid end materials:

PV	PVDF
SS	Stainless steel

Seal material:

T	PTFE seal

Diaphragm:

0	Standard diaphragm, PTFE version
1	Double diaphragm with diaphragm rupture indicator (retro fit possible)

Liquid end version:

0	No spring
1	With 2 valve springs, Hastelloy C, 0.1 bar
4	With pressure relief valve, Viton® seal, no valve spring
5	With pressure relief valve, Viton® seal, and valve spring

Hydraulic connection:

0	Standard threaded connector (according to technical data)
1	Union nut and PVC insert
2	Union nut and PP insert
3	Union nut and PVDF insert
4	Union nut and stainless steel insert
7	Union nut and PVDF hose nozzle
8	Union nut and stainless steel hose nozzle

Version:

0	With ProMinent® logo (standard)
1	Without ProMinent® logo

Electrical power supply:

S	3 ph, 230 V/400 V 50/60 Hz, 0.18 kW
M	1 ph, AC, 230 V/50/60 Hz, 0.18 kW
N	1 ph, AC 115 V 60 Hz, 0.18 kW
L	3 ph, 230 V/400 V, 50 Hz, (EExe, EExde)
P	3 ph, 230 V/400 V, 60 Hz, (EExe, EExde)
R	3 ph, variable speed motor, 230/400 V, 0.37 kW
V	Variable speed motor with integrated speed control 1 pH, 230 V, 50/60 Hz
Z	1 ph, variable speed control set 1 ph, 230 V, 50/60 Hz
1	No motor, with B14 flange (Gr. 71 (DIN))
2	No motor, C 56 flange (NEMA)
3	No motor, B5 Gr. 63 (DIN)
4	No motor, B5, Gr. 70 (DIN)

Motor version:

0	IP 55 (standard)
1	Exe version (II 2G EExe II T3)
2	Exde version (II 2G EExde IIC T4)
A	ATEX type drive

Stroke sensor:

0	No stroke sensor (standard)
1	with stroke sensor (Hall sensor, no connection cable)
2	Pacing relay (reed relay)
3	Stroke sensor (Namur) intrinsically safe

Stroke length adjustment:

0	Manual (standard)
1	With stroke positioning motor, 230 V/50/60 Hz
2	With stroke positioning motor, 115 V/50/60 Hz
3	With stroke control motor, 0...20 mA 230 V/50/60 Hz
4	With stroke control motor 4...20 mA 230 V/50/60 Hz
5	With stroke control motor 0...20 mA 115 V/50/60 Hz
6	With stroke control motor 4...20 mA 115 V/50/60 Hz

S2Ba ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

Viton® is a registered trademark of DuPont Dow Elastomers.

Identcode ordering system

Please enter the identcode on the device label into the grey box below.

S2Ca | **Sigma Control Type (S2Ca)**

HM | Power end, diaphragm

Pump typ: (figures 1+2 =back pressure [bar],figures 3-5 =feed rate [l/h])

16050	16 bar; 60 l/h
16090	16 bar; 95 l/h
16130	16 bar; 136 l/h
12050*	10 bar; 60 l/h
12090*	10 bar; 95 l/h
12130*	10 bar; 136 l/h
07120	7 bar; 148 l/h
07220	7 bar; 232 l/h
04350	4 bar; 350 l/h * for SST versions, max. 12 bar

Liquid end materials:

PV	PVDF
SS	Stainless steel

Seal material:

T	PTFE seal

Displacement element:

0	Standard diaphragm
1	Double diaphragm with rupture indicator incorporating “Pump stopping” function
2	Double diaphragm with rupture indicator incorporating “Pump alarm” function

Liquid end version:

0	No springs
1	With 2 valve springs,Hastelloy C,0.1 bar
4	With relief valve,Viton® seal,no valve spring
5	With relief valve,Viton® seal,with valve spring

Hydraulic connection:

0	Standard threaded connector (according to technical data)
1	Union nut and PVC insert
2	Union nut and PP insert
3	Union nut and PVDF insert
4	Union nut and stainless steel insert
7	Union nut and PVDF hose nozzle
8	Union nut and stainless steel hose nozzle

Version:

0	With ProMinent® logo
1	Without ProMinent® logo

Electrical power supply:

U	1 ph 100-230 V ±10 %, 50/60 Hz

Cable and plug:

A	2 m European
B	2 m Swiss
C	2 m Australian
D	2 m USA

Relays:

0	No relay
1	With fault indicating relay (N/C)
3	With fault indicating relay (N/O)
4	As 1 with pacing relay
5	As 3 with pacing relay
F	Power relay N/C
G	Power relay N/O

Control variant:

0	Manual + external with pulse control
1	Manual + external + pulse control + analogue
4	As 0 + process-timer
5	As 1 + process-timer
P	PROFIBUS®

Access code:

0	No access code
1	With access code

Metering monitor:

0	Input with pulse evaluation
1	Input with permanent contact evaluation

Stroke length adjustment:

0	Manual
C	Manual + calibration

S2Ca ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

Viton® is a registered trademark of DuPont Dow Elastomers.

1 Notes on safety of ProMinent® metering pumps

General user instructions

Please read through the following user instructions carefully! They will help you get the best use out of the operating instruction manual.

The following are highlighted in the text:

- Enumerations

▶ Instructions

Operating guidelines:

NOTE

Notices are intended to make your work easier.

and safety guidelines:

WARNING

Describes a potentially dangerous situation. If not avoided. could cause fatal or serous injury.

CAUTION

Describes a potentially dangerous situation. If not avoided. could cause slight or minor injury or damage to property.

IMPORTANT

Describes a potentially damaging situation. If not avoided. could cause damage to property.

Please also note the guidelines in “General Operating Instruction Manual for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories”!

EX-pump only: The nameplates affixed to the title page are identical to those on the pump supplied to enable clear identification on the correct operating instruction manual for the pump.

Please give the order number and the serial number, which you will find on the nameplates of the pump itself, in the event of any query or spare part order. This facilitates identification of the pump.

1.1 Summary of additional safety instructions for the EX version of the pump (in accordance with ATEX)

WARNING

- **In explosion-threatened workplaces in zone 1, device category II 2G of explosion group II C the pump may not be operated without the corresponding rating plate (and the corresponding EC conformity declaration) for pumps for explosion-threatened workplaces in accordance with guideline 94/9/EC of the European guidelines.**
- **From July 1st, 2003 on, only pumps with the corresponding marking according to EC-Ex-directive 94/9 may be used in industrial premises with potentially explosive atmospheres. The explosion group, category and type of protection shown on the marking must correspond to or exceed the conditions prevailing in the intended area of application.**
- **All other uses or modifications are prohibited!**
- **Pumps may never be operated in explosion-threatened workplaces without a corresponding rating plate (and the corresponding EC conformity declaration) for pumps for explosion-threatened workplaces.**

- **Installations in potentially explosive atmospheres must be inspected by a "accredited qualified" person. This applies in particular also for intrinsically safe electrical circuits.**
- **Drive motors must be secured by an appropriate motor protection switch. A motor protection approved for this application must be used for Ex"e"-motors. (Protection against heating due to overload)**
- **Observe all relevant standards e.g. DIN EN 60079, DIN EN 50020, DIN VDE 0165 and/or DIN VDE 0118 "Installing electrical equipment in explosion-threatened areas"!**
- **When installing the metering pump, observe the directives for the installation of devices in explosion-threatened areas, e.g. for Europe the European operator's guideline 99/92/EC (ATEX137)*, (in Germany implemented via the new operating safety ordinance (Official Federal Gazette for 2002, Part 1, No. 70, issued in Bonn 2.10.2002))!**
  *** previously ElexV**
- **Observe documents supplied with individual electric components!**
- **On principle, metering pumps in potentially explosive atmospheres must be equipped with a safety overflow valve at the outlet side of the pump (serves as protection against overheating due to overload and against sparks produced by shock due to overload which has led to the breakage drive parts.)**
- **When using with flammable media:**
  - **Diaphragm pumps with mechanically actuated diaphragm: no additional measures necessary, however, version with diaphragm rupture indicator, version Ex"i"*, must be used on principle.**
  - **For all metering pumps for metering inflammable media applies: starting up and emptying only supervised by a competent person.**
  - **Inflammable media may only be lifted with stainless steel liquid ends. - For exceptional cases, where this is not possible, also PTFE with carbon may be used, our versions TT_ are made of conductive plastics. In this case, special attention must be paid by the user due to the lower mechanical stability.**
- **If using the metering pump for Europe e.g. the European operator's guideline 99/92/EC* (ATEX 137**), (in Germany implemented via the new operating safety ordinance (Official Federal Gazette for 2002, Part 1, No. 70, issued in Bonn 2.10.2002) and the German dangerous chemicals ordinance))!**
  *** previously Ex Vo, Vb F**
  **** previously ATEX118A**
- **Observe also all relevant standards e.g. DIN EN 60079-10/14 and DIN EN 50020 for installations in explosion-threatened areas!**
- **Note all national directives which apply to the installation!**
- **Wear parts (diaphragms, bearings etc.) of metering pumps used in potentially explosive atmospheres must be replaced after having completed 90% of their nominal product life.**
- **The lubricant supply must be regularly checked for lubricated pumps, for instance by checking the fill level, visual inspection for leakages etc.**
- **The proper general function, in particular of the drive, must be safeguarded by regular inspections (leakages, noises, temperatures, possible discoloration due to excess temperatures....).**
- **Use original spare parts should exchange become necessary!**
- **Check that the pressure relief valve downstream from the pump is functioning correctly! The pressure relief valve must prevent the gearbox from being overloaded and over-heating in explosion-threatened workplaces!**
- **When cleaning plastic parts, attention must be paid to not generating any electrostatic charge by rubbing excessively. - see danger sign.**
- **These measures are the minimum protection measures specified bei ProMinent. Should the user know about any further risks, it is his duty to eliminate them by taking corresponding measures.**

Safety devices
The following safety notice must be affixed to the pump (with PP, PC and PV liquid ends, acrylic glass cover, ...)

EC conformity declaration / certificates
The EC conformity declaration for pumps for explosion-threatened workplaces is supplied with the pump (the copy of the EC conformity declaration for the pump itself does not apply to pumps designed for explosion-threatened workplaces).

The EC conformity declarations, the EC series prototype test reports and the operating manuals for the individual components are also supplied with the pump.

1.2 General notes

WARNING

- **The equipment/devices may only be used for their intended purpose.**
- **ProMinent® metering pumps must not be assembled with parts which are not tested and recommended by ProMinent otherwise this can lead to injury to persons and damage to property for which no liability will be accepted!**
- **Pumps must be accessible at all times to facilitate operation and maintenance. Access points must not be obstructed or blocked!**
- **Before carrying out any maintenance and repair work always drain off and flush out the liquid end first if hazardous or unknown metered media are used!**
- **When metering hazardous or unknown liquids, always wear safety clothing (safety goggles, gloves, ...) when working on the liquid end!**
- **You must observe the guidelines in this operating instructions manual and the ”General operating instructions manual for ProMinent® motor-driven metering pumps and hydraulic accessoires” on assembly, installation and maintenance!**

1.3 Notes on installation, start-up and operation

WARNING

- **The metering pump can contain water residue in the liquid end as the result of testing at the factory!**

  If handling media which must not come in contact with water, all traces of water must be removed from the liquid end before start-up! For this purpose, turn the pump through 180° and drain off the liquid end then flush with a suitable medium from above via the intake connection!
- **Do not connect mains voltage to the control cable!**
- **When operating the metering pump against a closed shut-off element on the pressure side or in the event of pressure peaks during the metering stroke, the system pressure can reach a multiple of the maximum permissible operating pressure that can consequently cause the pressure line to burst!**
- **To avoid this situation, an overflow is recommended for the purpose of limiting the maximum permissible operating pressure of the pump or system.**
- **Do not connect a metal bypass line to the overflow valve on the PVT delivery unit! This could cause cracks in the delivery unit!**

IMPORTANT

- **Set stroke length only with pump in operation!**
- **Pull the red plug for venting the gear unit during initial operation of the Sigma/ 2 metering pump (refer to Fig. 2, item 10)!**

NOTE

- **The pump must be secured in such a way that no vibrations can occur! The valves of the liquid end must always be positioned vertically in order to ensure trouble-free operation!**
- **The intake and delivery lines must always be arranged such as to ensure connection at the liquid end free of mechanical stress!**

  The lines must be secured such that no vibrations can occur!
- **Only use the clamping rings and hose sockets intended for the relevant hose diameter as well as original hoses with the specified hose dimensions and wall thickness otherwise the stability and durability of the connection will not be guaranteed!**

  Avoid reducing hose sizes!

  Observe the permissible pressure of the hoses!
- **A vent with return to the supply tank is advisable when metering extremely aggressive or hazardous media!**

  In addition, a shut-off valve should be provided on the delivery or intake side!

1.4 Notes on maintenance and repair

WARNING

- **Only specially trained and authorized persons are permitted to carry out maintenance on metering pumps and their peripherals!**
- **If hazardous or unknown metering media are used, always flush out the liquid end first before carrying out any maintenance and repair work!**
- **When metering hazardous or unknown liquids, always wear safety clothing (safety goggles, gloves, ...) when working on the liquid end!**
- **Always depressurize the delivery line first before carrying out any work on the pump!**
  Always discharge and flush liquid end!
  Observe safety data sheets for metered liquid!

DANGER

- **Disconnect power plug or power supply line before opening the plug!**
  Isolate relay option if applicable!
  Check to ensure power is disconnected!
  Secure pump while carrying out repairs to ensure it cannot be switched on unintentionally!
- **Pumps for metering radioactive media must not be shipped through standard channels!**

NOTE

The metering pump must be in a cleaned condition with the liquid end flushed if returned for repair!

2 Product description S2Ba/S2Ca

WARNING

Use for intended purpose

- **The pump is designed as a liquid medium metering pump; it serves the purpose of metering liquid medium within the specified line system!**
- **In explosion-threatened workplaces in zone 1, device category II 2G of explosion group II C the pump may not be operated without the corresponding rating plate (and the corresponding EC conformity declaration) for pumps for explosion-threatened workplaces in accordance with guideline 94/9/EC of the European guidelines.**
- **From July 1st, 2003 on, only pumps with the corresponding marking according to EC-Ex-directive 94/9 may be used in industrial premises with potentially explosive atmospheres. The explosion group, category and type of protection shown on the marking must correspond to or exceed the conditions prevailing in the intended area of application.**
- **Operate the pump only within the conditions described in the technical data!**
- **General restrictions with regard to viscosity limits, chemical resistance and density must be observed (refer to ProMinent® chemical resistance list (catalogue or homepage))!**
- **All other applications or conversion are prohibited!**
- **The pump is not designed to meter gaseous media as well as solids.**
- **For pumps without EX protection: The pump is not suitable for metering combustible liquids!**
- **Pumps may never be operated in explosion-threatened workplaces without a corresponding rating plate (and the corresponding EC conformity declaration) for pumps for explosion-threatened workplaces.**
- **Only specifically trained and authorized personnel are permitted to operate the pump!**

2.1 Identification of pump type

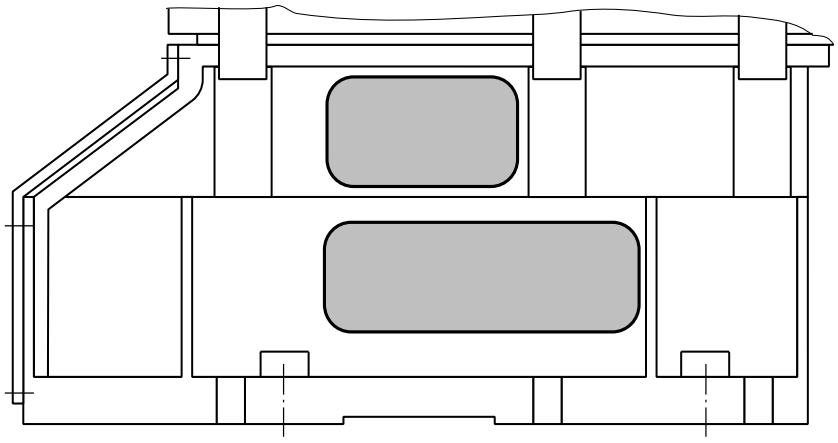


Fig. 1

The identity code and serial number are given in addition to the standard technical specifications. These two numbers must always be quoted when making any enquiries as they enable distinct identification of the type of metering pump.

2.2 Design/Functional description

2.2.1 Functional description, drive

The ProMinent® Sigma/ 2 diaphragm-type metering pump is an oscillatory displacement pump with the stroke length adjustable in steps of 0,5 %. It is driven by electric motor **(1)**. The rotary drive of the electric motor is stepped down by worm gear and transmitted via the eccentric roller **(3)** to the push rod **(4)** connected to fork **(8)** and converted into oscillatory movement. Return spring **(5)** presses the fork with push rod positively against the eccentric roller thus producing the return stroke. The stroke is adjusted by means of stroke adjustment knob **(6)** and spindle **(7)** by limiting the return stroke. Stroke movement is transmitted directly to the displacement diaphragm. Interacting with the valves, this diaphragm produces the overpressure and vacuum in the liquid end necessary for delivery. Flow is pulsating.

In the basic type, the electric motor is normally a 3-ph extended-range AC motor (refer to Section 3 for other options).

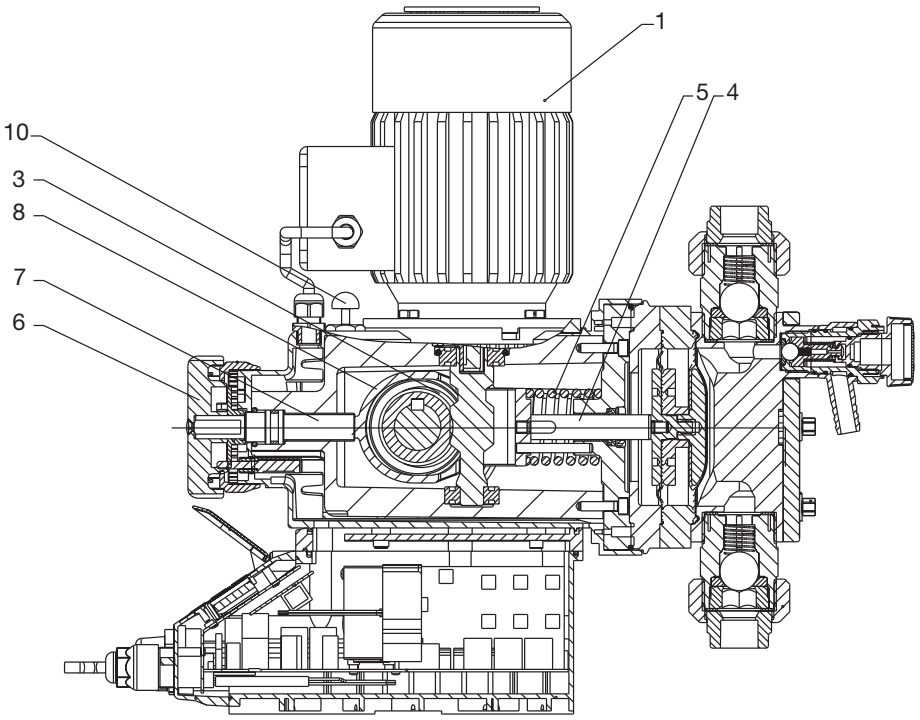


Fig. 2
61_01-101_00_25-01

2.2.2 Stroke movement

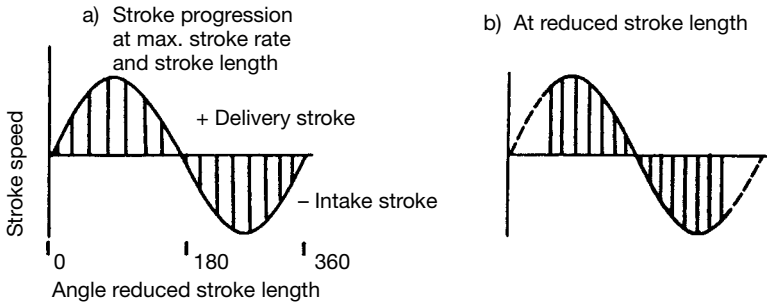


Fig. 3

Set stroke length dependent on the required delivery capacity.

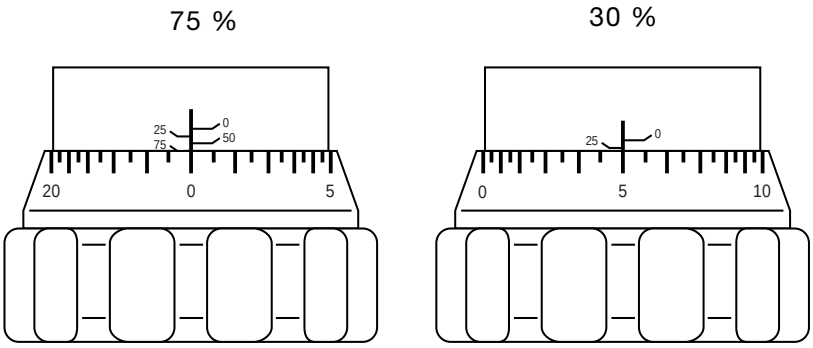
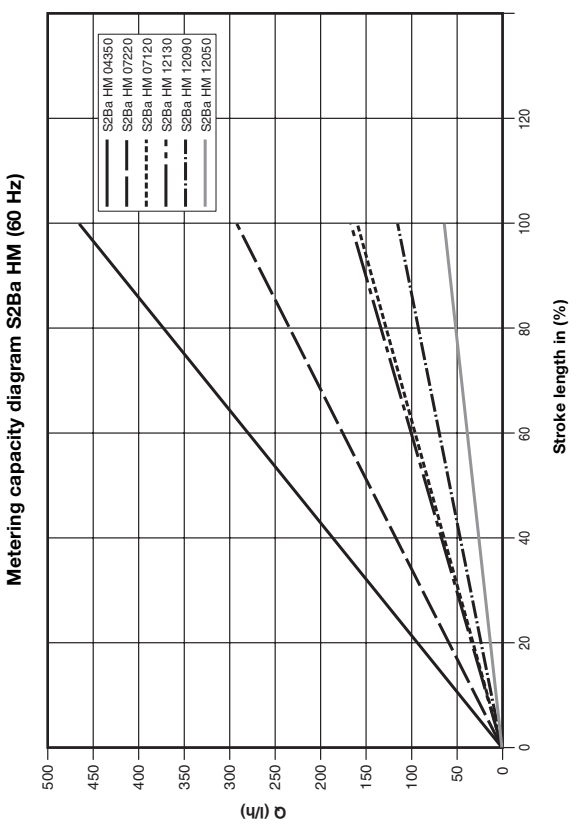


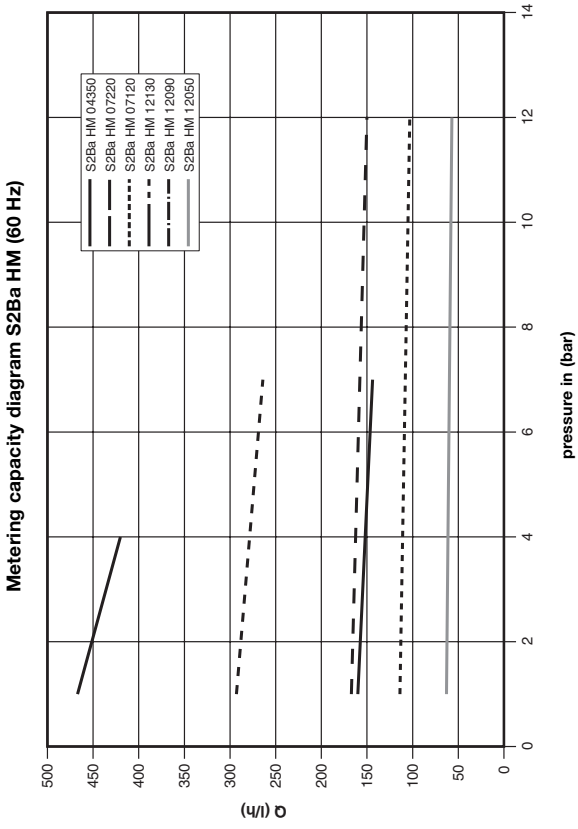
Fig. 4

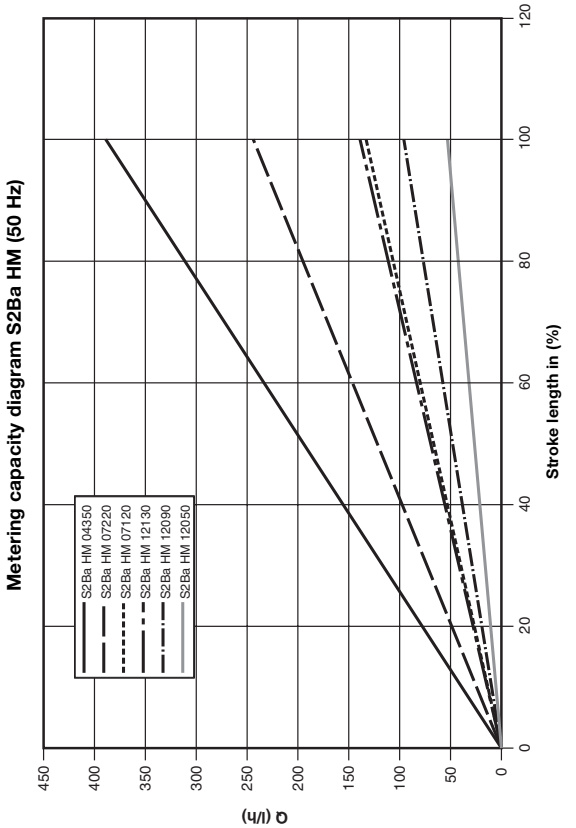
NOTE

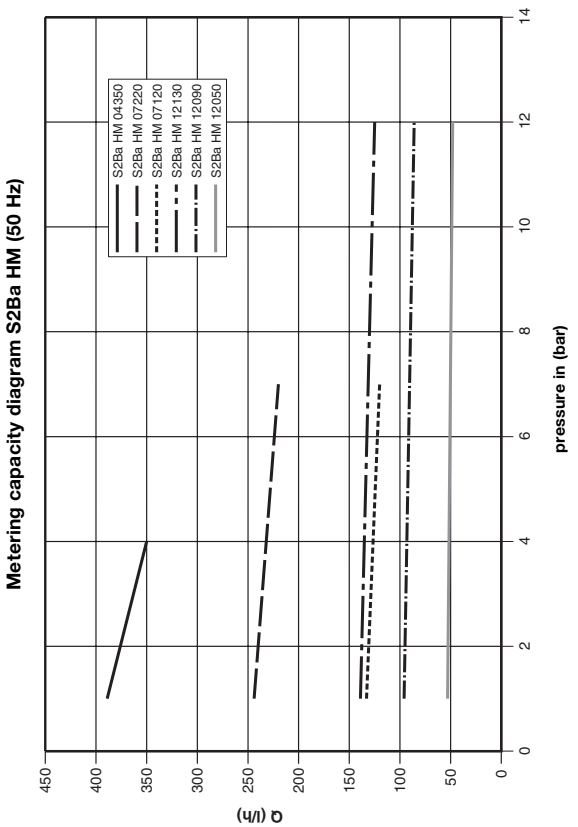
A large stroke length and low metering frequency should be selected for very viscous media!
A shorter stroke length and high frequency should be selected to achieve good mixing properties!

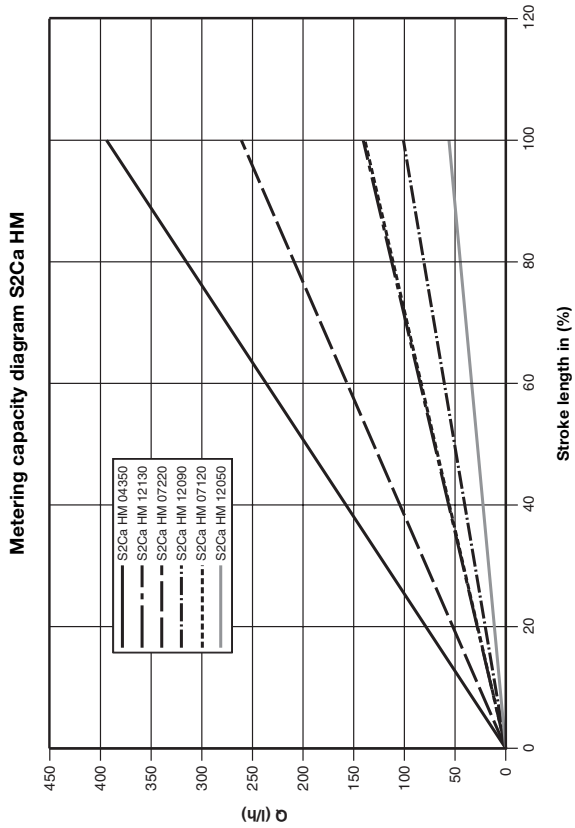
2.2.3 Metering capacity diagram

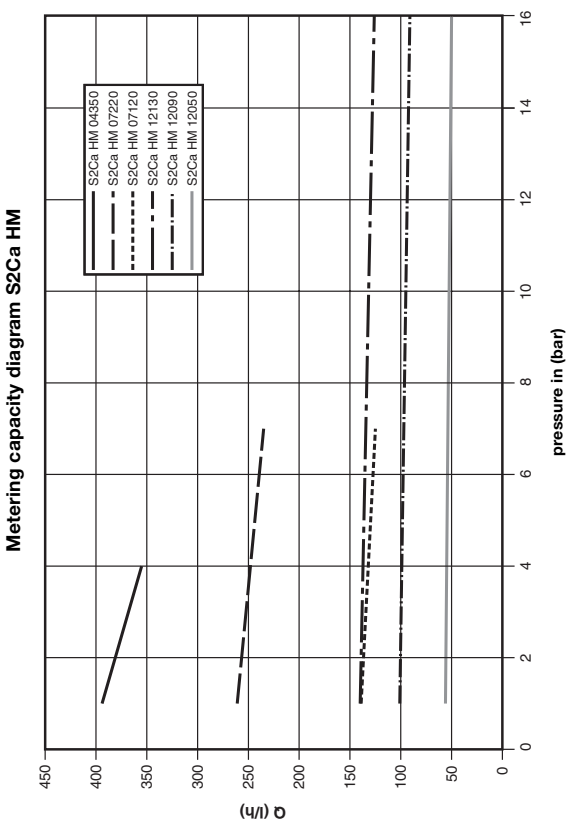









Metering capacity diagram S2Ca HM
Q (l/h)
Stroke length in (%)
S2Ca HM 04350
S2Ca HM 12130
S2Ca HM 07220
S2Ca HM 12090
S2Ca HM 07120
S2Ca HM 12050
0
50
100
150
200
250
300
350
400
450
0
20
40
60
80
100
120


Metering capacity diagram S2Ca HM
Q (l/h)
pressure in (bar)
S2Ca HM 04350
S2Ca HM 07220
S2Ca HM 07120
S2Ca HM 12130
S2Ca HM 12090
S2Ca HM 12050
0
50
100
150
200
250
300
350
400
450
0
2
4
6
8
10
12
14
16

2.2.4 Functional description, delivery unit

The heart of the delivery unit is the DEVELOPAN® metering diaphragm **(2)**. It hermetically seals the delivery chamber of liquid end **(4)** and produces a displacement in the liquid end. The end disc **(5)** made of chemically resistant plastic together with safety diaphragm **(13)** separates the drive housing from the delivery unit and protects the drive from corrosion in the event of the diaphragm failing. Delivery is based on the interaction between intake valve **(1)** and head valve **(3)** of the same design together with the diaphragm movement. The valve balls can be supported with springs for metering viscous media.

The connection dimensions of valves and liquid ends of the same size but with different materials are identical. These parts can be interchanged as required.

Materials and dimensions are specified in Section 3, Technical data.

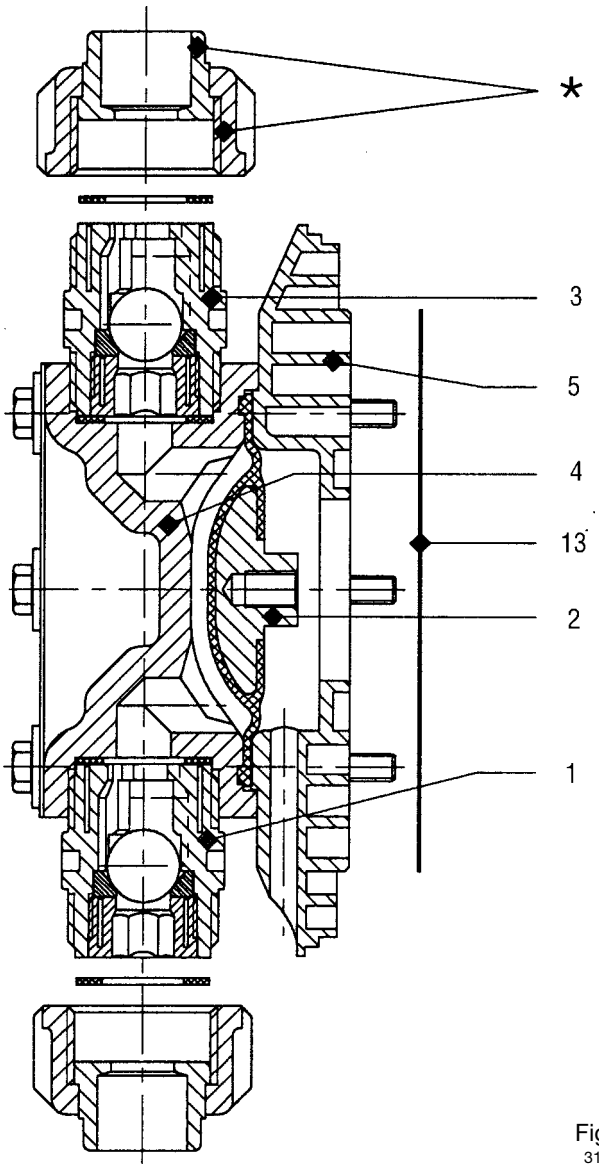


Fig. 5
3154-4

2.2.5 Integrated overflow valve with bleeder function

Task:

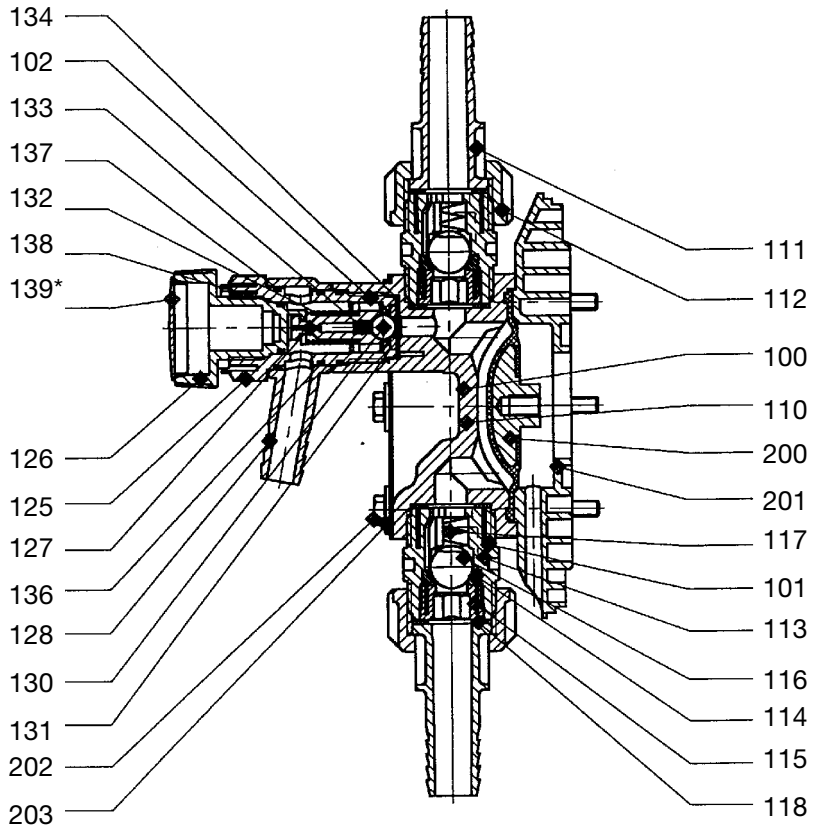
The task of the overflow valve is to protect the motor and gear unit against impermissible overpressure caused by the metering pump.

This function is produced by a spring-loaded ball.

A pressure relief mechanism for the bleeder function is provided.

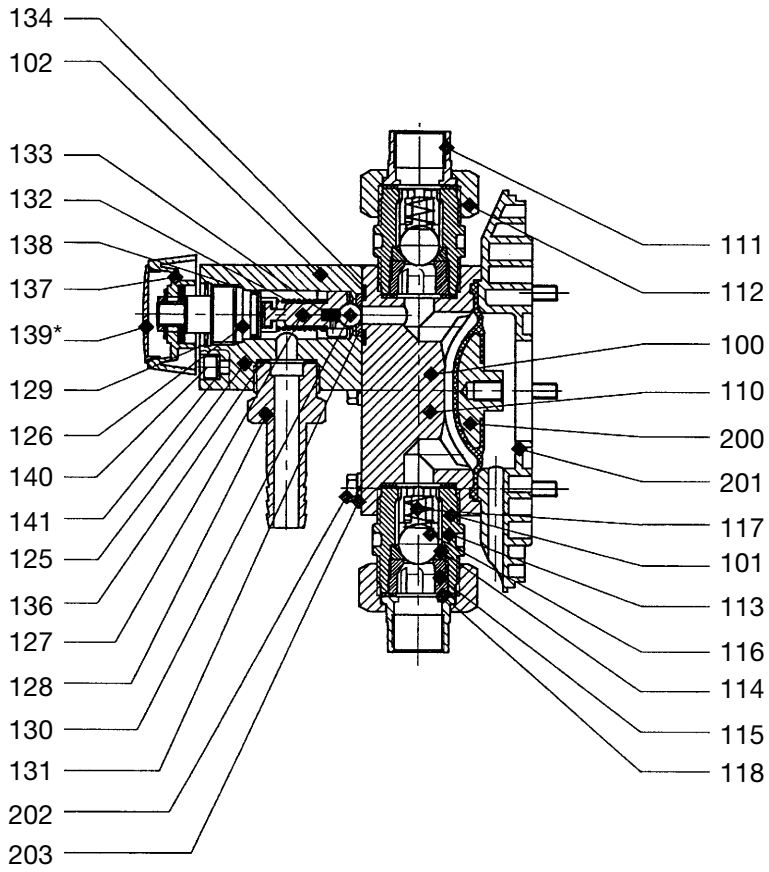
Design and functional description
(refer to Fig. No. 6 and 7)

Initially, the overflow valve illustrated under item 102 operates as a simple directly controlled **safety valve.** As soon as the pressure set with spring item 132 is exceeded, the effective pressure raises ball item 130. The liquid then flows off into the tank via hose connection item 128.



Overflow valve Sigma/ 2 liquid end, 10 bar PVT	Identcode Type: 12050, 12090, 12130
Overflow valve Sigma/ 2 liquid end, 7 bar PVT	Identcode Type: 07120, 07220
Overflow valve Sigma/ 2 liquid end, 4 bar PVT	Identcode Type: 04350

Fig. 6
3160-4



Overflow valve Sigma/ 2 liquid end, 16 bar SST	Identcode Type: 16050, 16090, 16130
Overflow valve Sigma/ 2 liquid end, 12 bar SST	Identcode Type: 12050, 12090, 12130
Overflow valve Sigma/ 2 liquid end, 7 bar SST	Identcode Type: 07120, 07220
Overflow valve Sigma/ 2 liquid end, 4 bar SST	Identcode Type: 04350

Fig. 7
3161-4

IMPORTANT

- **Knob item 139 must be turned in clockwise direction as far as it will go towards ”close“.**
- **The bypass line must always be closed and must be routed back into the supply tank. Connection via hose connection item 128.**
- **Minimal overflow can occur in the bypass line when the valve operates close to the overpressure function.**

The bleeder function is achieved by turning knob item 139 in counterclockwise direction as far as it will go towards ”open“: Priming aid for starting up pump against pressure. The force of spring item 132 relieves ball item 130 which is controlled by the lower spring force of bleeder spring item 133.

IMPORTANT

Once the pump has primed, turn knob item 139 in clockwise direction as far as it will go towards ”close“! The pump is now operational.

Technical data

Corresponding to the type of pump, overflow valves are available for pressure stages p_{nom} 4, 7, 10, 12 and 16 bar with (1.05 ... 1.15) xp_{nom} opening pressure.

Material in contact with metered medium

Material version	Liquid end	Suction/ discharge connector	Seals	Balls	Springs	Integrated overload valve
PVT	PVDF	PVDF	PTFE	Ceramic / glass*	Hastelloy C	PDFE/Viton®
SST	Stainless steel 1.4571/1.4404	Stainless steel 1.4581	PTFE	Stainless steel 1.4404	Hastelloy C	Stainless steel/ Viton®

*for 07120, 07220, 04350

Viton® is a registered trademark of DuPont Dow Elastomers.

Use for intended purpose/Use unintended purpose

Use for intended purpose

Protect the dosing pump against unacceptable high overpressure produced by the dosing pump.

Use the overflow value only in connection with liquid with a viscosity of up to max. 200 mPa s.

IMPORTANT

- **The ceramic ball and ball seat of the overflow valve are wearing parts. Slight leakage can occur at the safety valve after a prolonged period of operation. The ball and ball seat should be replaced if leaks occur.**
- **The bypass line must always be connected and must be routed back into the supply tank.**

Use for unintended purpose

To protect the system from impermissible overpressure.

The pump must not be operated without the bypass line connected.

The bypass line must not be connected in the intake line (the bleeder function will no longer be guaranteed). The bypass line must be routed back into the supply tank.

WARNING

When carrying out maintenance work on the overcurrent valve, pay attention to the tensioned state of the pressure spring item132! Wear safety goggles!

2.2.6 Diaphragm rupture sensor

Function:

Monitors the seals in the working diaphragm. This liquid end can continue to function for a short period in emergency mode, i.e. full operating pressure, no leakage, even after diaphragm rupture.

Design and function description (see Fig. 8)

Liquid ends with diaphragm rupture sensors comprise a standard liquid end (item 100) a working diaphragm (item 200) and an auxiliary diaphragm (item 148) The auxiliary diaphragm is positioned between the back plate (item 201) and the interim plate (item 147) and forms a sealed compartment together with the working membrane (item 200).

The leak tightness of the working diaphragm, Item 200, is monitored with a diaphragm failure detector, Item 104, that triggers a contact signal in the event of diaphragm failure so that the pump is stopped in the S2Ca and the diaphragm failure is indicated on a LCD.

The liquid end can continue to operate in emergency mode, i.e. full operating pressure, no leakage, even after diaphragm rupture, until the diaphragm has been replaced. We offer two versions of the S3Ca with diaphragm rupture sensor:

- After a working diaphragm rupture, the pump stops and an ”error“ message/diaphragm sensor signal is given.
- After a working diaphragm rupture, the pump will continue to run. An ”error“ message/ electrical signal is given.

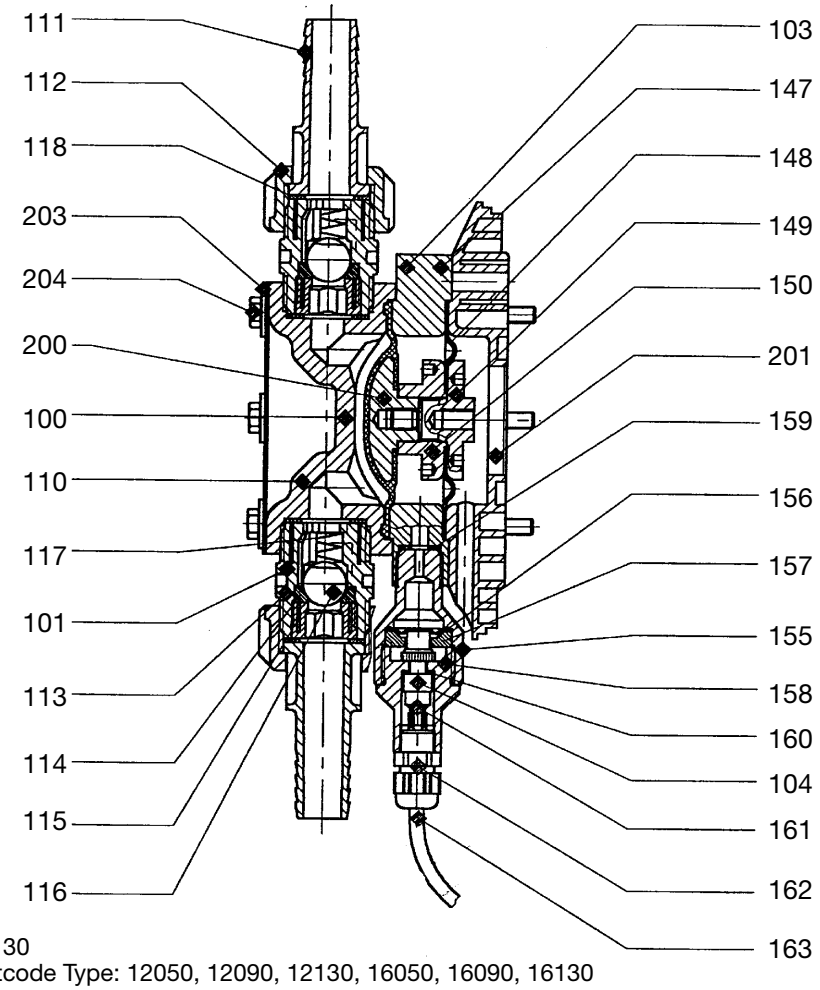
A function plug is supplied which allows the pump to continue operating after a fault has occurred (diaphragm rupture, failure of the diaphragm rupture sensor).

WARNING

- **EX-pump only: Installations in potentially explosive atmospheres must be inspected by a “accredited qualified” person. This applies in particular also for intrinsically safe electrical circuits.**
- **EX-pump only: observe documents supplied with the sensor!**

IMPORTANT

- **In the case of the S2Ba, the customer should install a diaphragm rupture signal monitor and/or ensure that the pump will stop after a diaphragm rupture.**
- **In the event of diaphragm failure, a contact signal is triggered as from 2 bar system backpressure.**
- **Exact pump delivery can no longer be guaranteed after failure of the working diaphragm.**
- **The auxiliary diaphragm, Item 148, is a wearing part and must be replaced after failure of the working diaphragm. The diaphragm rupture sensor lens, Item 156, should be replaced after every diaphragm rupture.**



FM 130
Identcode Type: 12050, 12090, 12130, 16050, 16090, 16130

FM 350
Identcode Type: 04350, 07120, 07220

Fig. 8
3162-4

Material in contact with metered medium

Liquid end:	Parts of diaphragm failure monitor in contact with medium	
	Lens, seals Item 148, 156, 159	Intermediate disc Item 147, intermediate bush Item 150
PVDF	PTFE	PVDF
Stainless steel 1.4571	PTFE	PVDF

Electrical data for the diaphragm breakage sensor

a) Switch contact

30 V DC/1 A or 125 V AC/0.6 A or 250 V AC/0.3 A

The diaphragm sensor is a N/C relay.

IMPORTANT

Before commencing operation, install the provided diaphragm breakage sensor together with the gasket (Item159) and make the electrical connections.

NOTE

- **For safety reasons it is advisable to connect a safe low voltage (e.g. EN 60335-1 (SELV)).**
- **The cable priority is arbitrary.**

b) Namur sensor, intrinsically

Blue	-
Brown	+

5-25 V DC, Namur type and/or DIN 19234, zero volt design.
Rated voltage: 8 V DC (R_i ~ 1 kΩ)
Power consumption:
Active surface, uncovered > 3 mA
Active surface, covered < 2 mA
Rated switching distance: 1.5 mm
The monitor/feeder must be capable of evaluating current changes in order to indicate diaphragm rupture!

WARNING

- **EX-pump only: Installations in potentially explosive atmospheres must be inspected by a "accredited qualified" person. This applies in particular also for intrinsically safe electrical circuits.**
- **EX-pump only: observe documents supplied with the sensor!**

IMPORTANT

- **Before commencing operation, install the provided diaphragm breakage sensor together with the gasket (Item159) and make the electrical connections.**
- **For pump without EX protection: For safety reasons it is advisable to connect a safe low voltage (e.g. EN 60335-1 (SELV)).**

3 Technical data

3.1 Technical data Sigma/ 2

3.1.1 Capacity data

Technical data S2Ba at 50 Hz operation

	Feed rate at maximum back pressure			Max. stroke rate	Suction lift	Admissible priming pressure suction side	Connection suction / discharge side	Shipping weight
Pump type Sigma/	**bar**	**l/h**	**ml/stroke**	**strokes/min.**	**m Ws**	**bar**	**G - DN**	**kg**
12050 PVT	10	50	11.4	73	7	3	1"-15	15
12050 SST	12	48	11.4	73	7	3	1"-15	20
16050 SST	16	48	11.4	73	7	3	1"-15	20
12090 PVT	10	90	11.4	132	7	3	1"-15	15
12090 SST	12	86	11.4	132	7	3	1"-15	20
16090 SST	16	86	11.4	132	7	3	1"-15	20
12130 PVT	10	130	10.9	198	7	3	1"-15	15
12130 SST	12	125	10.9	198	7	3	1"-15	20
16130 SST	16	125	10.9	198	7	3	1"-15	20
07120 PVT	7	120	27.4	73	5	1	20*	16
07120 SST	7	120	27.4	73	5	1	20*	24
07220 PVT	7	220	27.7	132	5	1	20*	16
07220 SST	7	220	27.7	132	5	1	20*	24
04350 PVT	4	350	29.4	198	5	1	20*	16
04350 SST	4	350	29.4	198	5	1	20*	24

All performance data applies to water at 20 °C.

The suction lift applies when the suction line and liquid end are full and correctly installed.

* Sigma types 07120, 07220 and 04350, the valves used in the liquid end are DN 25 (G1 1/2). Since DN 20 is usually adequate for this tubing (see Technical Data, connection-suction/discharge side) the connector parts to be ordered by Identcode (e.g. washers) have already been reduced to DN 20, i.e. tubing and accessories can be DN 20.

Technical data S2Ba at 60 Hz operation

	Feed rate at maximum back pressure			Max. stroke rate	Suction lift	Admissible priming pressure suction side	Connection suction / discharge side	Shipping weight
Pump type Sigma/	**bar**	**psi**	**l/h/gph**	**strokes/min.**	**m Ws**	**bar**	**G - DN**	**kg**
12050 PVT	10	145	60/ 15.9	87	7	3	1"-15	15
12050 SST	12	174	57/ 15.2	87	7	3	1"-15	20
16050 SST	16	232	57/ 15.2	87	7	3	1"-15	20
12090 PVT	10	145	108/ 28.5	156	7	3	1"-15	15
12090 SST	12	174	103/ 27	156	7	3	1"-15	20
16090 SST	16	232	103/ 27	156	7	3	1"-15	20
12130 PVT	10	145	156/ 41	232	7	3	1"-15	15
12130 SST	12	174	150/ 39.6	232	7	3	1"-15	20
16130 SST	16	232	150/ 39.6	232	7	3	1"-15	20
07120 PVT	7	100	144/ 38	87	5	1	20*	16
07120 SST	7	100	144/ 38	87	5	1	20*	24
07220 PVT	7	100	264/ 69.7	156	5	1	20*	16
07220 SST	7	100	264/ 69.7	156	5	1	20*	24
04350 PVT	4	58	420/ 111	232	5	1	20*	16
04350 SST	4	58	420/ 111	232	5	1	20*	24

All performance data applies to water at 20 °C.

The suction lift applies when the suction line and liquid end are full and correctly installed.

* Sigma types 07120, 07220 and 04350, the valves used in the liquid end are DN 25 (G1 1/2). Since DN 20 is usually adequate for this tubing (see Technical Data, connection-suction/discharge side) the connector parts to be ordered by Identcode (e.g. washers) have already been reduced to DN 20, i.e. tubing and accessories can be DN 20.

Technical data S2Ca

	Feed rate at maximum back pressure			Max. stroke rate	Suction lift	Admissible priming pressure suction side	Connection suction / discharge side	Shipping weight
Pump type Sigma/	**bar**	**l/h**	**ml/stroke**	**strokes/min.**	**m Ws**	**bar**	**R - DN**	**kg**
12050 PVT	10	145	60/ 16	90	7	2	1"-15	17
12050 SST	12	174	60/ 16	90	7	2	1"-15	22
16050 SST	16	232	60/ 16	90	7	2	1"-15	22
12090 PVT	10	145	95/ 25	160	7	2	1"-15	17
12090 SST	12	174	95/ 25	160	7	2	1"-15	22
16090 SST	16	232	95/ 25	160	7	2	1"-15	22
12130 PVT	10	145	136/ 36	200	7	2	1"-15	17
12130 SST	12	174	136/ 36	200	7	2	1"-15	22
16130 SST	16	232	136/ 36	200	7	2	1"-15	22
07120 PVT	7	100	148/ 39	90	5	1	1½ - 20*	18
07120 SST	7	100	148/ 39	90	5	1	1½ - 20*	26
07220 PVT	7	100	232/ 61	160	5	1	1½ - 20*	18
07220 SST	7	100	232/ 61	160	5	1	1½ - 20*	26
04350 PVT	4	58	350/ 93	200	5	1	1½ - 20*	18
04350 SST	4	58	350/ 93	200	5	1	1½ - 20*	26

All performance data applies to water at 20 °C.

The suction lift applies when the suction line and liquid end are full and correctly installed.

* Sigma types 07120, 07220 and 04350, the valves used in the liquid end are DN 25 (G1½). Since DN 20 is usually adequate for this tubing (see Technical Data, connection-suction/discharge side) the connector parts to be ordered by Identcode (e.g. washers) have already been reduced to DN 20, i.e. tubing and accessories can be DN 20.

Materials in contact with chemicals

Material version	Liquid end	Suction/ discharge connector	Seals	Balls	Springs	Integrated overload valve
PVT	PVDF	PVDF	PTFE	Ceramic / glass*	Hastelloy C	PDFE/Viton®
SST	Stainless steel 1.4571/1.4404	Stainless steel 1.4581	PTFE	Stainless steel 1.4404	Hastelloy C	Stainless steel/ Viton®

* for 07120, 07220 and 04350

Temperature specifications

Permissible storage temperature: –10 to +50 °C
Permissible ambient temperature: –10 to +40 °C

Temperature compatibility (medium temperature) of materials

Material:	Long-term at max. backpressure:	Short-term, max. 15 min. at max. 2 bar
PVT	65 °C	100 °C
SST	90 °C	120 °C

The specified temperatures (see above) can be exceeded temporarily, e.g. for sterilisation or flushing with hot water.

Accuracy

Under constant conditions and in minimum stroke length of 30 % corresponding to following notes, the reproducibility of the metered quantity is better than ±2 %.

All specifications refer to metered quantities with water at 20 °C and correct installation of the metering pump.

3.1.2 Dimensions Sigma/ 2 (mm)

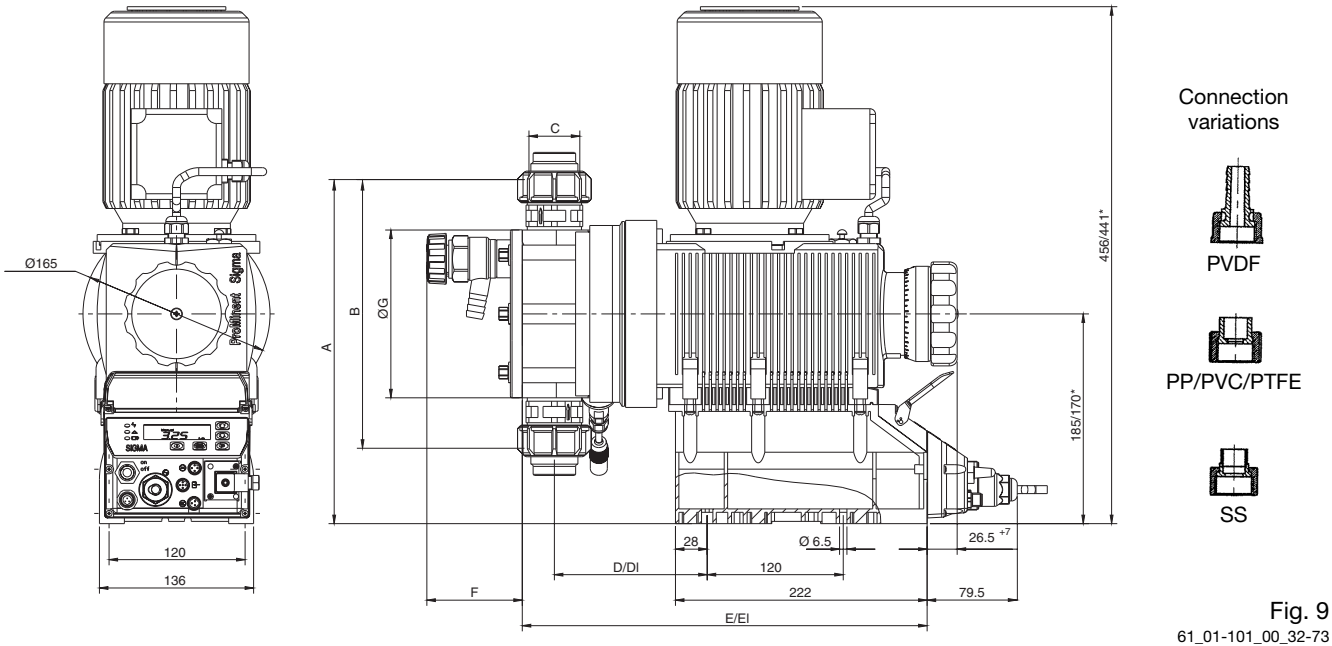


Fig. 9
61_01-101_00_32-73

* Dimensions for S2Ba

Model	Connector	A	B	C	D	D1**	E	E1**	F	Q G
FM 130 PVT	DN 15	265/250*	160	G 1 A	104	124	326/329*	346/349*	82	101
FM 130 SST	DN 15	265/250*	160	G 1 A	104	124	326/329*	346/349*	82	101
FM 350 PVT	DN 25	304/289*	237	G 1 1/2 A	115	135	337/340*	357/360*	84	148
FM 350 SST	DN 25	304/289*	237	G 1 1/2 A	115	135	337/340*	357/360*	84	148
FM 130 = Identcode type 16050,16090,16130				FM 350 = Identcode type 04350,07120,07220						

* Dimensions for S2Ba
** Dimensions with diaphragm rupture sensor

3.1.3 Dimension sheet Sigma/ 2 with stroke adjustment motor

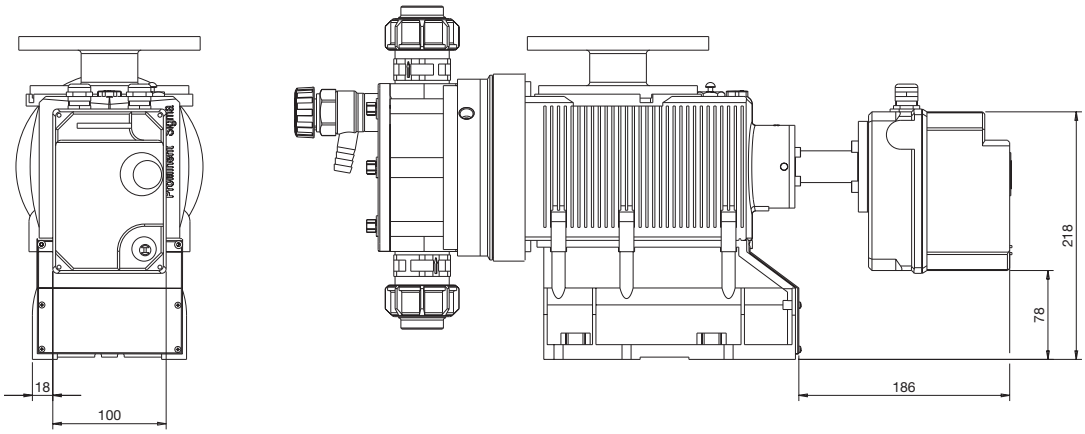


Fig. 10
61_01-101_00_39-73_2_HM

3.1.4 Motor data

Electrical Data

Motors:					Identcode characteristic	
3 ph IP 55	230 V/400 V	50 Hz	0.25 kW	1.62/0.94 A	S	
3 ph IP 55	230 V/400 V	60 Hz	0.25 kW	1.42/0.82 A	S	
1 ph AC	230 V	50/60 Hz	0.18 kW	1.7/1.5 A	M	
1 ph AC	115 V	60 Hz	0.18 kW	3.3 A	N	
3 ph EXe or EXde	230 V/400 V	50 Hz	0.18 kW	1.1/0.7 A	L	
3 ph EXe or EXde	230 V/400 V	60 Hz	0.18 kW	1.1/0.6 A	P	
3 ph IP 55	230 V/400 V	50/60 Hz	0.37 kW	.....	R	Version with external fan 1 PH 230 v; 50/60 Hz and PTC
1 ph IP 55	230 V	50/60 Hz	0.37 kW	.....	V	Three phase motor with integrated speed changer, (see chapter 11)

For more details you can request the motor specification sheets. Custom motors and/or custom motor flanges are available on request.

WARNING

- **EX-pump only: Drive motors must be secured by an appropriate motor protection switch. A motor protection approved for this application must be used for Ex“e”-motors. (Protection against heating due to overload)**
- **EX-pump only: motors in EX-areas must be installed and checked by persons with “recognised skills”!**
- **EX-pump only: observe the operating manual supplied with the EX motor!**

Fuse data

IMPORTANT

- **The motors are not fuse-protected. Fit a motor circuit breaker!**
- **When connecting the motor, make sure that it rotates in the correct direction (see Fig. 11).**

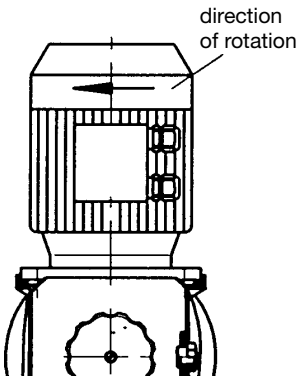


Fig. 11

Protection against accidental contact and moisture (IP)

Motor: IP 55 DIN EN 60034-5 (in accordance with DIN VDE 0470 Part 1, corresponds to EN 60529 and IEC 529).

External fan

Notes on electrical connection of the motor, of the external fan in the case of variable speed motors with external fan and the temperature monitor can be found in the “General Operating Instructions Manual for ProMinent® Motor Driven Metering Pumps and Hydraulic Accessories”!

3.1.5 Stroke actuator drive mechanism

230 V ± 10 %	50/60 Hz	11.7 W
115 V ± 10 %	60 Hz	11.7 W

Cf. “Appendix” for terminal connection diagram.

3.1.6 Stroke adjuster drive mechanism

230 V ± 10 %	50/60 Hz	6.5 W
115 V ± 10 %	60 Hz	6.5 W

Cf. “Appendix” for terminal connection diagram.

3.1.7 Electrical data, stroke sensor “Sigma”

a) Reed contact (Identcode characteristic “Stroke sensor”: 1)

Pin 1 (white) = 4.5 V to 24 V, max. 10 mA
Pin 2 (brown) = OUT, open collector, 24 V, 20 mA
Pin 3 (green) = GND
Pulse width (low) ≥ 4 ms (depending on gearbox and power frequency)

b) Namur sensor, intrinsically (Identcode characteristic “Stroke sensor”: 3)

WARNING

- **EX-pump only: intrinsically safe installations must be installed and checked by persons with “recognised skills”!**
- **EX-pump only: observe documents supplied with the sensor!**

Blue	-
Brown	+

5-25 V DC, Namur type and/or DIN 19234, zero volt design.
Rated voltage: 8 V DC (R_i ~ 1 kΩ)
Power consumption:
Active surface, uncovered > 3 mA
Active surface, covered < 1 mA
Rated switching distance: 1.5 mm
The monitor/feeder must be capable of evaluating current changes in order to indicate diaphragm rupture!

3.1.8 Electrical data, pacing relay “Sigma”

Relay input

(power supply for the relay board)

Input voltage	Mains frequency	Power consumption
200/230 V AC (180-254 V)	50/60 Hz	10 mA (230 V/50 Hz)
100/115 V AC (90-134 V)	50/60 Hz	15 mA (115 V/60 Hz)
24 V DC (20-28 V)	-	10 mA at 24 V DC

Relay output

Voltage, max.	24 V DC
Current, max.	100 mA
Hook up duration Standard	100 ms adjustable

The contacts are zero volt.

3.1.9 Sound intensity level

The sound intensity level is < 70 dB (A)
at maximum stroke, maximum stroking rate, maximum back pressure (water) in accordance with DIN EN 12639 (noise measurement in fluid pumps)

4 Start-up/Maintenance

WARNING

- **For all metering pumps for metering inflammable media applies: Starting up and emptying only supervised by a competent person.**

IMPORTANT

Observe the safety notes provided in Section 1.

4.1 Start-up

All general guidelines in the accompanying ”General operating instructions ProMinent® motordriven metering pumps and hydraulic accessories” apply.

Diaphragm pumps with mechanically actuated diaphragm: no additional measures necessary, however, version with diaphragm rupture indicator, version Ex“i”*, must be used on principle.

For all metering pumps for metering inflammable media applies: starting up and emptying only supervised by a competent person.

Inflammable media may only be lifted with stainless steel liquid ends. - For exceptional cases, where this is not possible, also PTFE with carbon may be used, our versions TT_ are made of conductive plastics. In this case, special attention must be paid by the user due to the lower mechanical stability.

4.2 Maintenance

WARNING

- **EX-pump only: Wear parts (diaphragms, bearings etc.) of metering pumps used in potentially explosive atmospheres must be replaced after having completed 90% of their nominal product life.**
- **The lubricant supply must be regularly checked for lubricated pumps, for instance by checking the fill level, visual inspection for leakages etc.**
- **EX-pump only: check that the pressure relief valve downstream from the pump is functioning correctly!**
  The pressure relief valve must prevent the gearbox from being overloaded and overheating in explosion-threatened workplaces!
- **The proper general function, in particular of the drive, must be safeguarded by regular inspections (leakages, noises, temperatures, possible discoloration due to excess temperatures....).**
- **Use original spare parts should exchange become necessary!**
- **EX-pump only: When cleaning plastic parts, attention must be paid to not generating any electrostatic charge by rubbing excessively. - see danger sign.**
- **EX-pump only: metering pumps and their peripheral equipment must be serviced by specially trained or authorised personnel!**

IMPORTANT

After loosening the liquid end screws (e.g. to change the valves or diaphragm), the screws must be retightened clockwise to the specified tightening torque.

What requires maintenance?

- Secure fit of liquid end screws.
- Secure fit of metering lines (intake and delivery sides).
- Secure fit of head valve and intake valve.
- Leakage hole at end disc for moisture (indicates possible diaphragm failure).
- Operate pump continuously for a short period of time in order to check whether it delivers correctly.

Maintenance intervals

General recommendation for maintenance intervals - every 3 months.

Shorter intervals are recommended if operated under load conditions (e.g. continuous operation).

The gear oil should be changed after approx. 5000 duty hours.

Gear oil ISO viscosity class VG 460, e.g. Mobil Gear 634,

ProMinent Order No. 555325 (Amount of oil approx. 0.5 l).

The metering diaphragm is a wearing part whose service life is dependent on following parameters:

- System backpressure.
- Operating temperature.
- Properties of medium to be metered.

The service life of the diaphragm is restricted in the case of abrasive media. In such cases, it is recommended to check the diaphragm more frequently and to install a diaphragm failure monitor.

4.3 Replacement of wearing parts

Replacing diaphragm (see exploded diagrams in appendix!)

WARNING

- **EX-pump only: metering pumps and their peripheral equipment must be serviced by specially trained or authorised personnel!**
- **Always use original spare parts.**

IMPORTANT

Flush liquid end first in the case of hazardous media. For this purpose, force water or a suitable flushing agent through the intake connection of the liquid end with a wash bottle.

▶ Set stroke length to zero with the pump running. Switch off pump.

▶ Release the six screws holding the liquid end, detach liquid end together with screws.

▶ Release diaphragm from the push rod by jolting in counterclockwise direction and unscrew.

▶ Screw on new diaphragm until it is firmly seated on the push rod. Mount the dosing head with screws such that the suction connection lies at the bottom (observe the flow through direction / arrow marks on the valves). Switch on pump. Set stroke length to 100 % and turn in screws then tighten crosswise to 7.5 ± 0.5 Nm. Check pump for leaks at max. pressure.

NOTE

The tightening torque of the liquid end screws should be rechecked after 24 hours of operation.

The tightening torques of the liquid end screws should be checked every 3 months for the PVT material version.

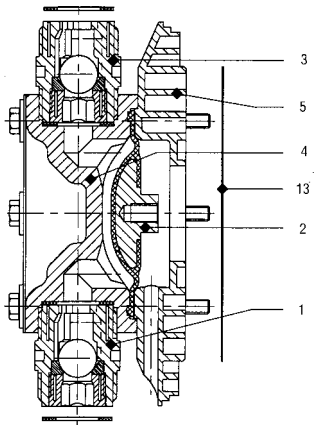


Fig. 12

GUIDELINE ON VALVE INSTALLATION

In the case of suction problems during installation, place the valves on a firm surface and tap the PTFE ball seat disk lightly with a brass rod and a hammer weighing about 300 g. Let the valves such in the wet state.

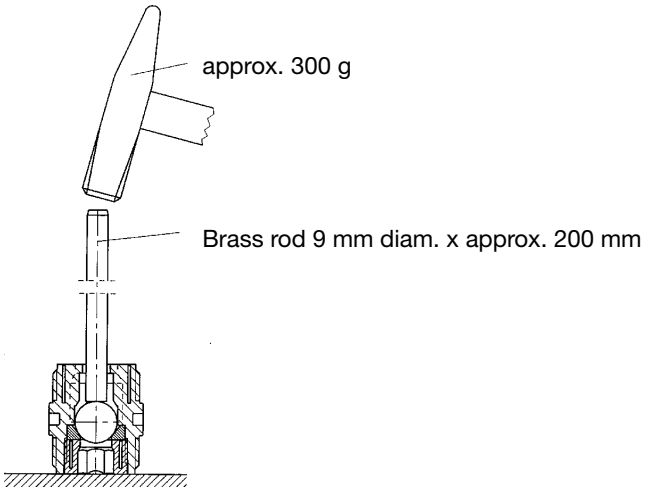


Fig. 13

NOTE

- **If suction problems with the pump or leakage at the overcurrent valve are encountered, first clean the ball and the ball seat disc.**
- **For media containing particles larger than 0.3 mm it is absolutely essential to install a filter in the suction line.**

5 Features of the S2Ca metering pumps

5.1 Function description, motors

The pump has an integrated electronic overload cut-out in all versions. This responds as soon as the maximum admissible power consumption is reached and stops the motor.

- ▶ If the motor stops due to a system overload the electronic controller detects the fault and transmits a message which is displayed on the display panel and at the pump.
- ▶ The fault signal can be cancelled by pressing the ”P“ key, altering the level for a brief period at the pause input (switch function) or by reconnecting the pump to the mains.

IMPORTANT

If the motor has been switched off via the electronic overload cut-out, check that the pump is not continuously overloaded.

NOTE

- **The motor is supplied pre-wired.**
- **The performance data in 3.1.1 are measured with the S2Ba (base model with 3-phase motor). If the S2Ba has been fitted with a 1-phase motor there may be up to 5 % speed reduction due to the different motor characteristic curve, i.e. corresponding 5 % reduced feed rate.**
- **The controller changes over to digital stroking mode at low stroke frequencies! This takes place at stroke frequencies below 1/3 of the maximum stroke frequency. This function is designed to ensure sufficient cooling of the motor and low stroke frequencies.**

Type: 100 – 230 V ± 10 %, 50/60 Hz

	at 100 V	**at 230 V**
nominal output	250 W	250 W
nominal current	3.2 A	2.0 A
peak current (in operation)*	10 A	5.5 A
making peak current	12 A	24 A
fuse, internal**	4.0 AT (1.5kA)	4.0 AT (1.5kA)

* internal switching
** Only genuine ProMinent fuses, item no. 732414, may be used!

5.2 Function description, controller

Operating modes

Operating modes are selected using the MODE menu (depending upon identity code, some operating modes may be absent).

“Analogue” operating mode: (Identity code, control variant: analogue)
The stroke rate is controlled via an analogue electrical signal via the “external control” terminal. Signal processing is pre-selected at the controller.

“Manual” operating mode:
The stroke rate is controlled manually via the controller.

“Contact” operating mode:
This operating mode offers the opportunity to make fine adjustments with small increase/ decrease factors. Dosing can be activated by a pulse via the “external control” terminal or by a semiconductor element. With the “pulse control” option it is possible to pre-set a feed quantity (batch) or number of strokes (factor 0.01 to 99.99) via the control unit.

“Batch” operating function:
This operating mode offers the option of working with larger transfer factors (up to 65535). Metering can be triggered by pressing the P key or a pulse from the “external control” terminal via a contact or semiconductor element. A batching quantity or number of strokes can be pre-selected via the control unit.

"PROFIBUS®" mode: (Identity code, control variant: PROFIBUS®)
This operating mode provides the option of controlling the pump via the PROFIBUS® (see "Supplementary instructions for ProMinent® gamma/ L and ProMinent® Sigma versions with "PROFIBUS®").

Functions

The following functions can be selected using the SET menu:

"Calibrate" function (Identcode, stroke length adjustment: manual + calibration):
The S3Ca can be operated in all operating modes including in calibrating mode. The corresponding continuous displays can show the actual feed quantity or the feed rate. Calibration is maintained within the stroke frequency range 0-180 strokes/ min. Calibration is also maintained when a stroke frequency is altered up to ±10 % scale divisions.

"Auxiliary frequency" function:
It is possible to set a stroke rate in the SET menu, which may be activated via the "external control" terminal. This auxiliary frequency overrides all other pre-set stroke rate frequencies.

"Flow" function:
Stops the S2Ca when the flow is insufficient. In the SET menu, the number of failed strokes is entered after which the pump will be turned off.

The following functions are available as standard:

"Float switch" function:
Information on the liquid level in the feed chemical container is transmitted to the S2Ca. This option requires the installation of a 2-stage float switch. This is connected to the "float switch" terminal.

"Pause" function:
The S2Ca can be stopped by remote control via the "external control" terminal. The "pause" function operates only via the "external control" terminal.

The following functions are activated by keystrokes:

"Stop" function:
The S2Ca can be stopped by pressing the STOP/START key without disconnecting from the mains power supply.

"Prime" function:
Priming (short term feed at maximum frequency) is activated by pressing both arrow keys at the same time (in "Stroke rate" permanent display).

Optional relay

The S2Ca has two connection options (not in PROFIBUS® version).

Optional "fault-indicating relay" or "power relay":
In the event of fault signals, warning signals or float switch activation signals, connects an electrical circuit to trigger alarm sirens etc. The relay is retrofitted via an aperture in the power end.

"Fault indicating and pacing relay" option:
In addition to the fault indicating relay the pacing relay can make a contact with every stroke. The relay is retrofitted via an aperture in the power end.

Function and error indicators

The operating and error status is shown via the three LEDs and the "error" indicator on the LCD (see also section 9):

LCD indicator

If a fault occurs "error" will appear along with an additional fault warning.

LED indicator

Operating indicator (green)
This indicator is lit as long as the S2Ca is operating correctly. It goes out briefly with every stroke.

Warning indicator (yellow)
This warning light appears if the S2Ca electronics detect a situation that could lead to a fault, e.g. "liquid levels low 1st stage".

Error indicator (red)
This warning light appears if a fault occurs, e.g. "liquid levels low 2nd stage".

Hierarchy of operating modes, functions and fault statuses

The different operating modes, functions and fault statuses each have a differing effect on whether and how the S2Ca functions. These effects are given below:

1. **Prime**
2. **Fault, stop, pause**
3. **Auxiliary frequency**
4. **Manual, analogue, contact, batch**

i.e.

1. “Prime” can be activated in “Stroke rate” permanent display in any pump status (as long as it is operable)
2. “Fault”, “stop” and “pause” stop all system parts up to “prime”.
3. The stroke rate of the “auxiliary frequency” always overrides the stroke rates of the operating modes listed in point 4.

5.3 Sockets, symbols and wiring diagram

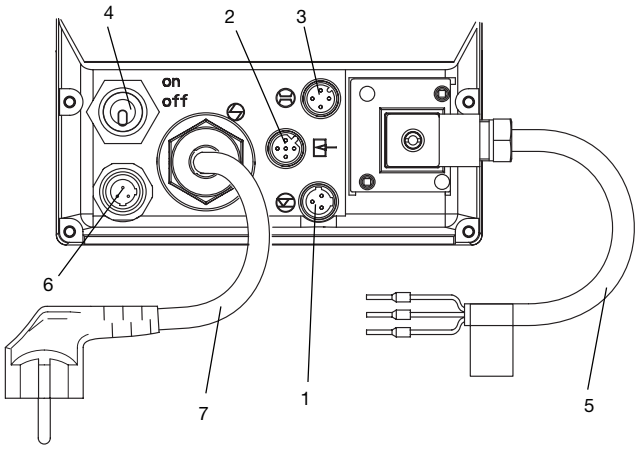


Fig. 14

(1) Socket for two-stage float switch with advance warning and de-activate function (with function plug*, not illustrated)

(2) External socket for contact or analogue controller with zero volts deactivation via pause function (with function plug* - not illustrated)

(3) Metering monitor socket for connection of ProMinent® metering monitor

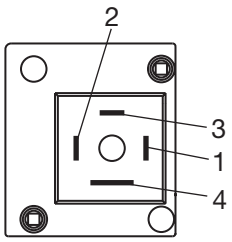
(4) Mains switch (1-pin)

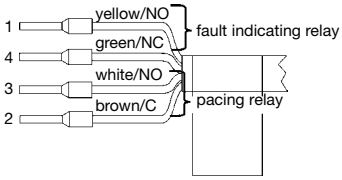
(5) Relay cable (fault indicating or pacing relay)

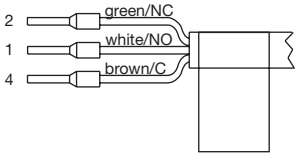
(6) Socket for diaphragm rupture sensor

(7) Mains lead with plug

*Must be plugged in unless cable attached.







Technical data, relay (control version)

Pump type S2Ca

Relay	**Fault-indicating relay**	**Fault-indicating relay + pulse generator**	
Relay type	Fault-indicating relay	pulse generator	Fault-indicating relay
Voltage, max:	250 V 50/60 Hz	24 V DC	24 V 50/60 Hz
Current, max.	2 A (ohmic)	100 mA	100 mA
Hook up duration		100 ms	
Behaviour	see Identcode	see Identcode	see Identcode
Service life	> 200 000 cycles*	> 50 x 10^6 (10 V 10 mA)	> 200 000 cycles

Relay type	Power relay
Voltage, max.	250 V (50/60 Hz)
Current, max.	16 A (ohmic)
Hook up duration	
Behaviour	see Identcode
Service life	> 30 000 cycles*

* in the case of nominal load

The contacts are zero volt.

N/C fault indicating relay - the relay closes immediately after the power is switched on and opens in the event of a fault.

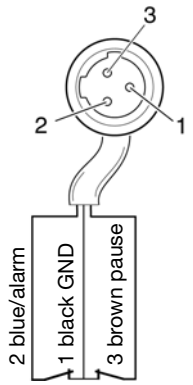
N/O fault indicating relay, the relay closes in the event of a fault.

Use suitable interference suppression (e.g. RC glands) when connecting inductive loads.

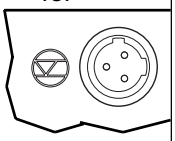
Wiring diagram

View of cable connectors from front

Float switch cable

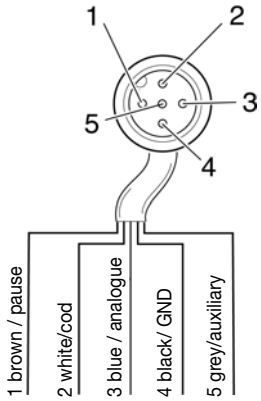


for

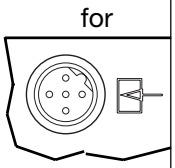


Blue and black open
-> alarm signal
Brown and black open
-> alarm signal + pump stops

Universal signal cable (5-score)



for



Pause function:
brown and black closed
-> pump metering

brown and black open
-> alarm + pump stopped

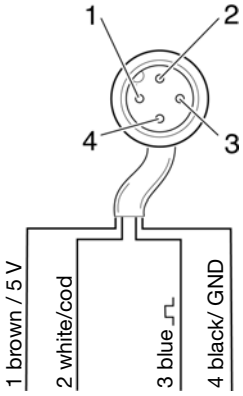
External/contact:
white and black closed
-> start contact for pump
(note pause function:
brown and black closed?)

Analogue:
blue, black
-> analogue output 0/4-20 mA
(note pause function:
brown and black closed?)

Auxiliary frequency:
grey and black closed
-> pump metering at pre-set stroking rate

➜ Circuit examples see p. 40

Metering monitor cable



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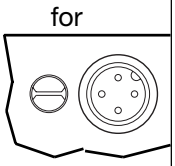
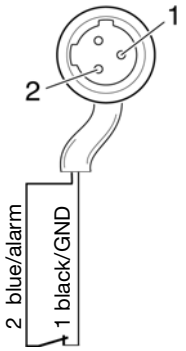


Diaphragm rupture cable



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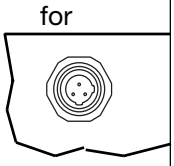
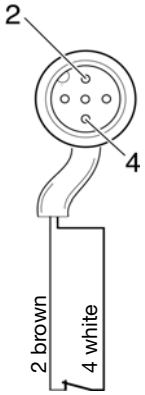
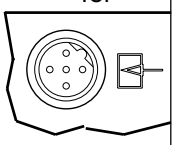


Contact open -> alarm
-> pump stops with controller type 0

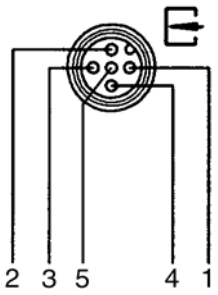
External/contact cable (2 core)



for



Contact closed -> metering stroke



Technical data, external contact

Semi-conductor switch elements (e.g. transistors in open-collector circuits) or contactors (relays) with a residual voltage of -0.7 V can be used as input switch elements.

Controller type 0 (see identity code)

Pin 1 = Pause input (activating function)

Voltage at open contacts: approx. 5 V
Input resistance: 10 kΩ
Controller: – zero volts contact (approx. 0.5 mA)
– semi-conductor (residual voltage: < 0.7 V)

Pin 2 = Contact input

Voltage at open contacts: approx. 5 V
Input resistance: 10 kΩ
Controller: – zero volts contact (approx. 0.5 mA)
– semi-conductor (residual voltage: < 0.7 V)
Min. contact duration: 20 ms
Max. pulse frequency: 25 pulses/s

Pin 3 = unused

Pin 4 = GND

Pin 5 = Auxiliary input

Voltage at open contacts: approx. 5 V
Input resistance: 10 kΩ
Controller: – zero volts contact (approx. 0.5 mA)
– semi-conductor (residual voltage: < 0.7 V)

Controller type 1 (see identity code)

Pin 1 = Pause input (activating function)

Voltage at open contacts: approx. 5 V
Input resistance: 10 kΩ
Controller: – zero volts contact (approx. 0.5 mA)
– semi-conductor (residual voltage: < 0.7 V)

Pin 2 = Contact input (not active during analogue operation)

Voltage at open contacts: approx. 5 V
Input resistance: 10 kΩ
Controller: – zero volts contact (approx. 0.5 mA)
– semi-conductor (residual voltage: < 0.7 V)
Min. contact duration: 20 ms
Max. pulse frequency: 25 pulses/s

Pin 3 = Identical to input*

Input load: approx. 120 Ω

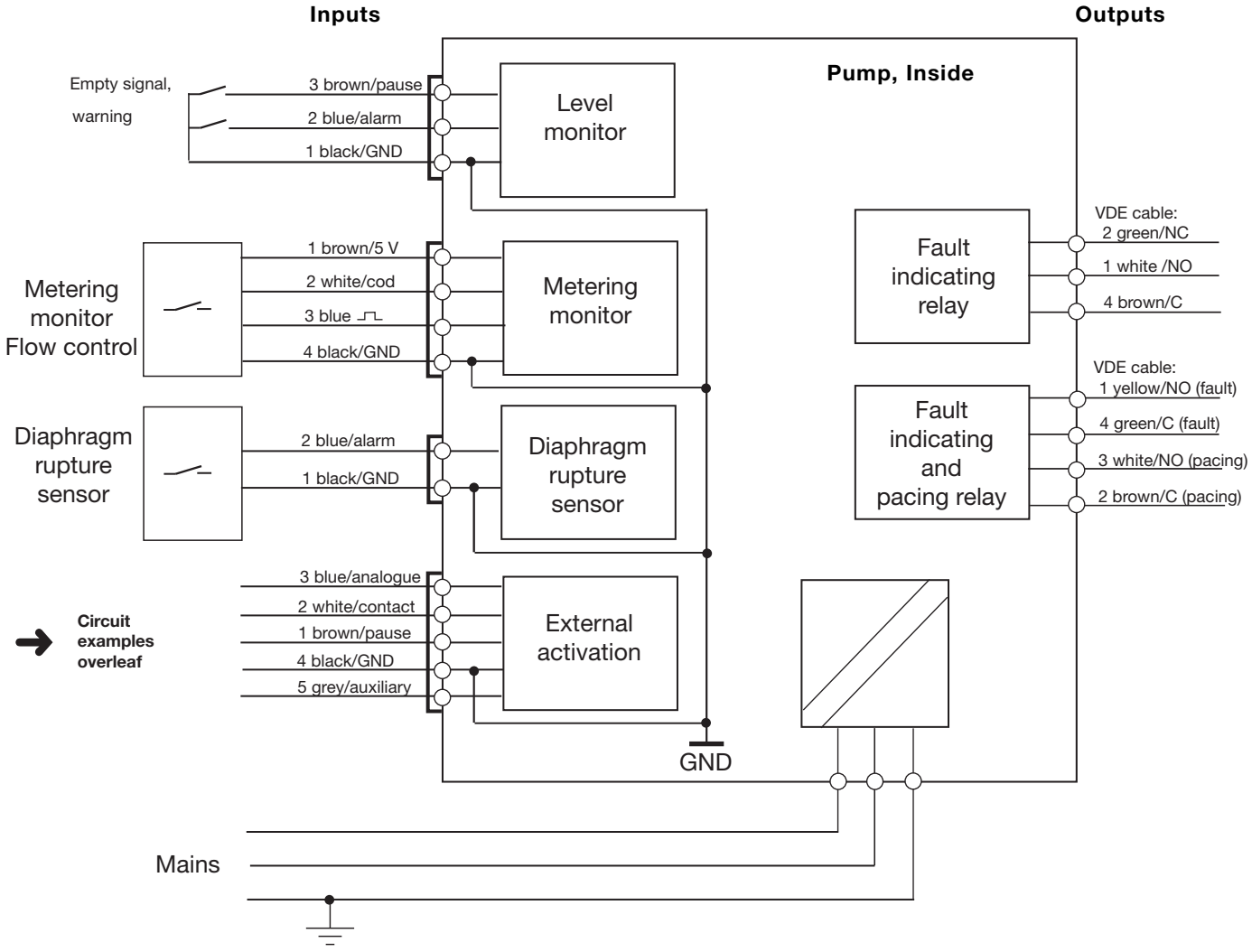
Pin 4 = GND

Pin 5 = Auxiliary input

Voltage at open contacts: approx. 5 V
Input resistance: 10 kΩ
Controller: – zero volts contact (approx. 0.5 mA)
– semi-conductor (residual voltage: < 0.7 V)

* The metering pump makes its first metering stroke at approx. 0.4 mA (4.4 mA) and starts continuous operation at approx. 19.2 mA.

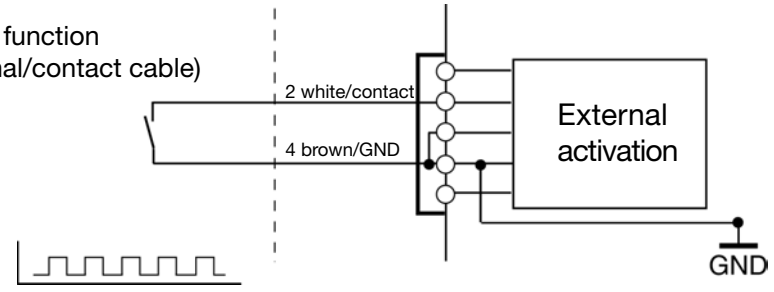
Block circuit diagram S2Ca



Circuit examples: universal signal cable

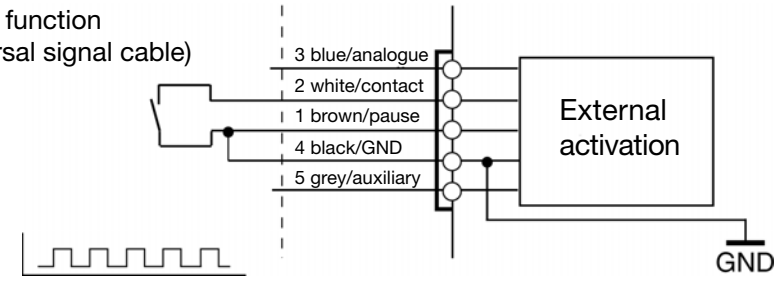
by customer **Cable** **Pump, inside**

„External contact“ function
(ProMinent® external/contact cable)
two-core



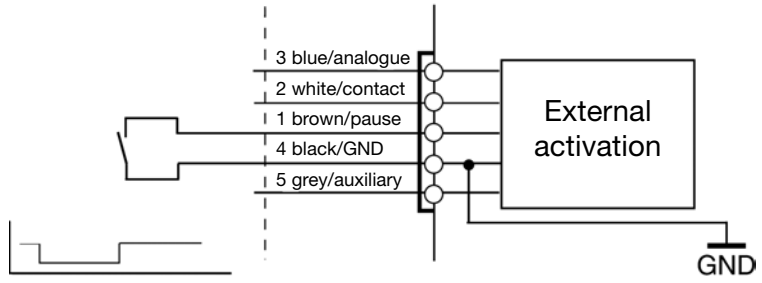
Pulse rate,
e.g. contact water meter

„External contact“ function
(ProMinent® universal signal cable)
five-core



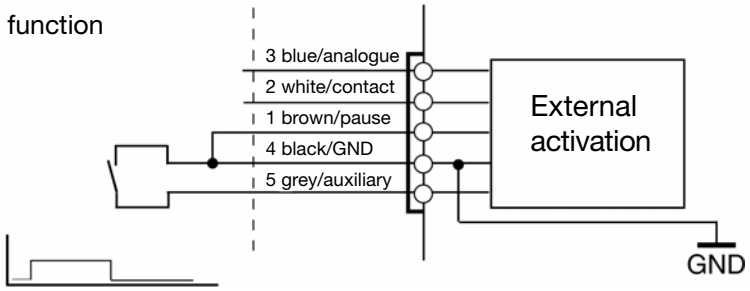
Pulse rate,
e.g. contact water meter

„Pause“ function



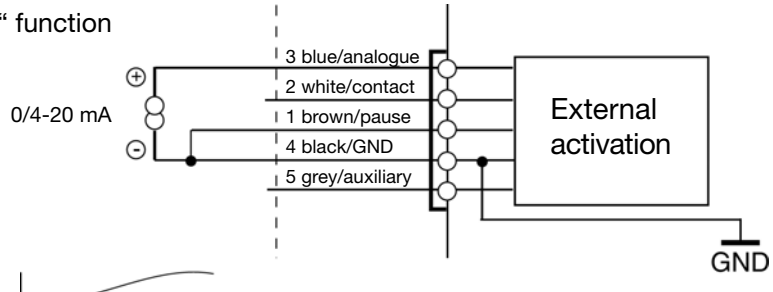
Permanent contact,
e.g. from control room

„Auxiliary frequency“ function



Permanent contact,
e.g. from control room

„External analogue“ function



Analogue signal,
e.g. from magnetic inductive
flow meter

IMPORTANT

- **The universal signal cable, the external/contact cable and the level monitor cable should not be less than 1.20 m long, otherwise cable recognition will fail.**

5.4 Retrofitting relays

(not in PROFIBUS® version)

Delivery range:

1 relay circuit set with 2 screw fasteners
1 relay cable set with socket
1 seal

Press-out relay opening

WARNING

Disconnect the S3Ca from the mains power supply and rinse liquid end before commencing work (see section 10)!

IMPORTANT

When preparing the opening, ensure that the punch is not forced through the entire pump base!
Pump circuits may become damaged.

- ▶ Place the S2Ca on a firm surface with the relay opening press-out section at the top (see fig. 15)
- ▶ Place a punch (dia. 8-15 mm) in the centre of the relay opening press-out section , and strike briefly and sharply with a hammer (approx. 250 g)
- ▶ If necessary clean up the edges of the opening
- ▶ Remove the pressed out section from the S2Ca

Inserting the relay component

- ▶ Hold the relay component with your right hand gripping the left and right hand edges of the relay cover, and tilt the front end slightly to the left (see fig. 16)
- ▶ Push the relay component through the relay opening, holding the upper corner of the lower edge against the guide rail on the pump base, until the contact of the relay component has reached the controller contact. (test: can you still move the end of the circuit back and forth?)
- ▶ Gently push the relay component right into the opening
- ▶ Screw the relay cover firmly onto the housing using the screws provided
- ▶ Insert the relay cable plug seal into the relay cover and screw on the plug (see fig. 18)
- ▶ The pump is generally programmed ex-factory to ”drop-out action alarm relay“ and – if fitted – ”pull-up action clock pulse generator relay“. If a switching function is required, the pump can be reprogrammed at the Heidelberg plant (not necessary by PROFIBUS®-version).

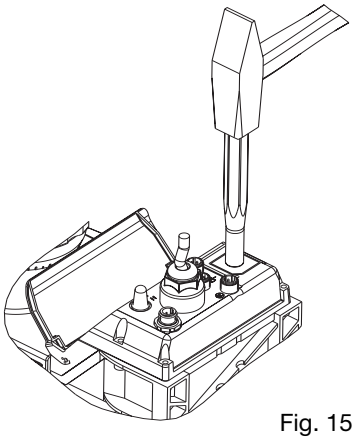


Fig. 15

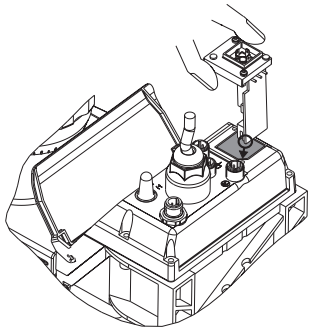


Fig. 16

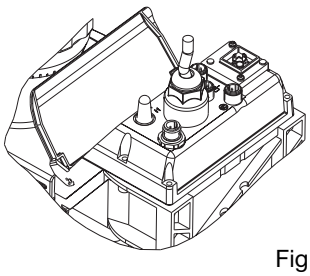


Fig. 17

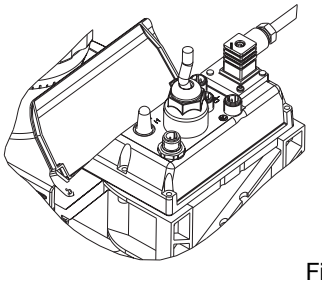
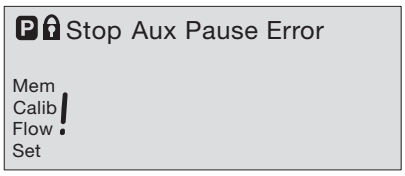


Fig. 18

6 Control elements

Please acquaint yourself with the S2Ca control elements with the help of the “control elements and key functions” overview!

Indicators The LCD display supports the operation and setting of the S2Ca with a range of indicators:



The indicators are interpreted as follows:

Symbol for P key:	The S2Ca is in settings mode.
Close symbol:	In a continuous display: lock (if code has been set). In settings mode: indicates access to code menu.
Stop:	The S2Ca has been stopped using the STOP/START key.
Aux:	The S2Ca is pumping at the auxiliary frequency. In AUX menu: the S2Ca is in the AUX menu.
Pause:	The S2Ca has been stopped using the “pause” function (external).
Error:	A fault has occurred and the pump has been stopped.
Mem:	An additional “memory” function has been set in the “contact” and “batch” operating modes. In CNTCT or BATCH menus (“mem” flashes): the memory function can be set.
Calib:	The S2Ca is in the CALIB menu. In a continuous display (“calib” flashes”): Deviation from the stroking rate from the value at the time of the calibration by more than 10 percent (e.g. in the case of a stroke length of 40% when it has been set to less than 30% or more than 50%).
Flow:	The S2Ca is in the FLOW menu.
Set:	The S2Ca is in the SET menu.
Exclamation mark:	The number of strokes reached is above the maximum value (99999) that can be shown in the LCD display.

NOTE

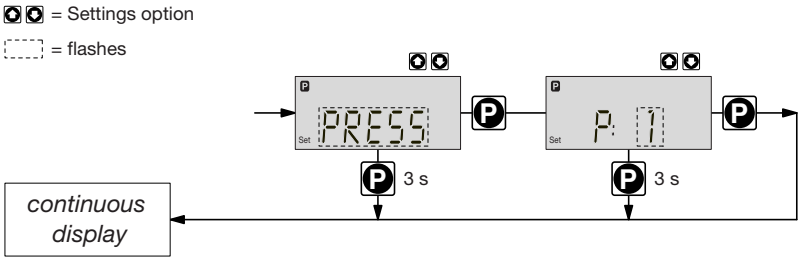
When calibrated, the S2Ca displays the feed rate and the feed capacity in l and/or in l/h or in gal and/or g/h.

7 Settings

NOTE

- **Open out the fold-out page following the title page fully! There you will find the overviews “control elements and key functions” and “operating settings diagram”.**
- **If no keys are pressed within a period of 1 minute, the S2Ca will return to a continuous display.**

Basic information for setting up the S2Ca

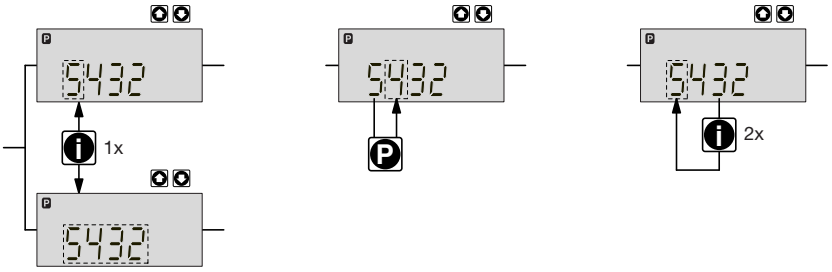


Confirm entries

Press the P key briefly;
you will automatically move to the next menu option or to a continuous display.

Exit menu option without confirming

Press the P key for 3 s:
The entry is cancelled and you will return to a continuous display.



Incremental change Iof a value

Press the i key 1x;
you can toggle between altering the digits of a value (“change individual digits” = standard) or incremental alteration of a value (“change a figure”).

Change adjustable values

Press UP or DOWN arrow key;
The flashing digit or figure will start to increase or decrease incrementally.

Confirm adjustable values

For “change individual digits”: confirm each digit using the P key. When the last digit has been confirmed you will automatically move to the next menu option or to a continuous display.

For “change a figure”; press the P key 1x; you will simultaneously move to the next menu option or to a continuous display.

Correct wrongly set digits

Press the i key 2x;
you will go back to the first digit.

7.1 Check adjustable values

Before setting up the S2Ca you can check the current settings of adjustable values:

Press the i key (“i” as in “info”) when the S2Ca is in continuous display mode (There is no P key symbol in the LCD display).

Each time you press the i key you will see a different continuous display. The number of continuous displays depends upon the identity code, the selected operating mode and the connected accessories (see overview “continuous displays”).

7.2 Change to settings mode

If you hold down the P key for 2 seconds in any continuous display, the S2Ca will change to the settings mode.
If CODE 1 is set, the code must be entered after pressing the P key.

The following menu options appear first in the settings mode (see also overview “operating/ settings diagram”):

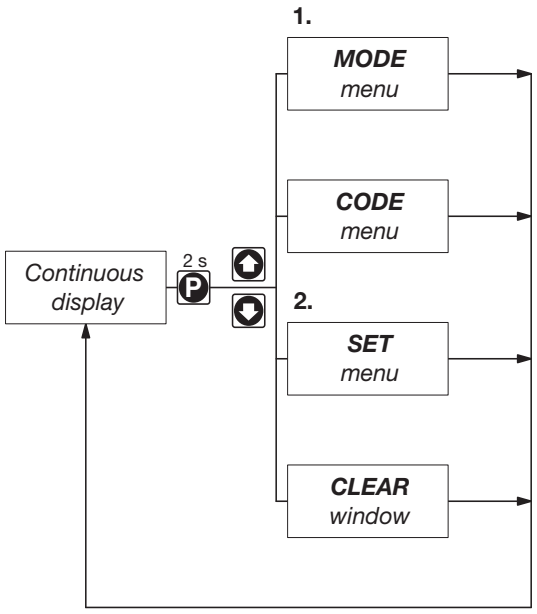
- MODE menu
- CODE menu (optional)
- SET menu
- CLEAR window

In order to adapt the S2Ca to your process requirements you must:

1. **Select the operating mode in the MODE menu.**
2. **If necessary enter the settings for this operating mode in the SET menu.**
   Exception: Timer and PROFIBUS®.

IMPORTANT

Note the diagram below!

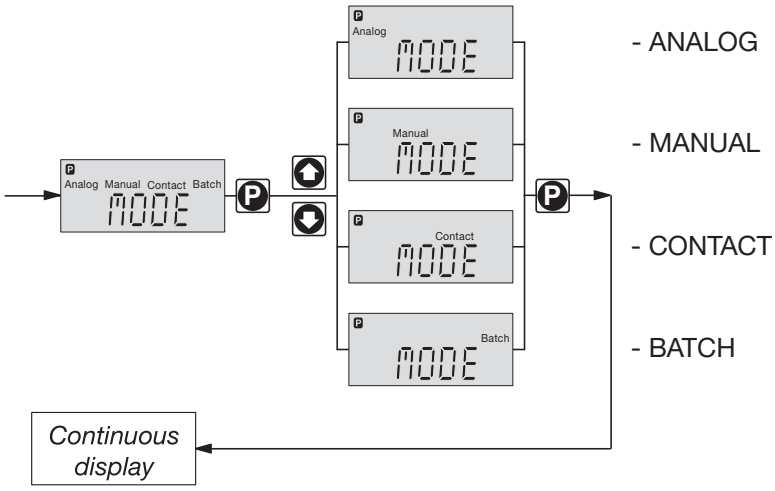


7.3 Select operating mode (MODE menu)

The following operating modes are selected via the MODE menu (depending upon identity code, some operating modes may be absent):

- Manual: for operation by hand
  (Identity code, control variant: manual, standard option)
- Analogue: for electronic control
  (Identity code, control variant: analogue current)

- Contact: for contact operation
  (Identity code, control variant: external 1:1 / external with pulse control)
- Batch: for batch operation
  (Identity code, control variant: external with pulse control)



7.4 Settings for operating mode (SET menu)

NOTE

First select the operating mode in the MODE menu!
Exceptions: Timer and PROFIBUS®.

In the SET menu you can adjust various settings depending upon the selected operating mode.

The following programmable function settings menus appear in all operating modes:

- Calibrate (CALIB menu)
- Auxiliary frequency (AUX menu)
- Flow (FLOW menu, available only if flow monitor is connected)

See also section 7.5!

Further settings menus depend upon the selected operating mode.

7.4.1 Settings for “manual” operating mode

There are no other settings menus in the overall SET menu for the “manual” operating mode apart from those described in 7.5.

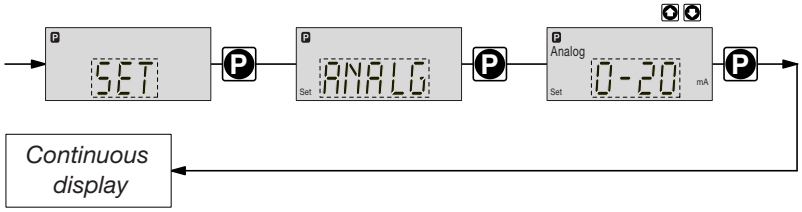
7.4.2 Settings for “analogue” operating mode (ANALG menu)

In addition to those settings menus described in 7.5, there is an additional ANALG menu in the overall SET menu for the “analogue” operating mode.

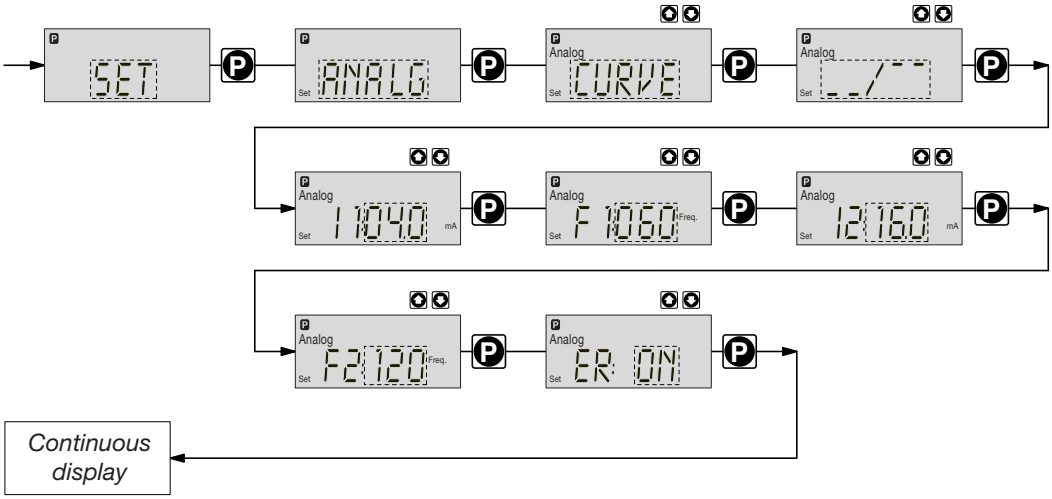
The stroke rate is controlled by an analogue electrical signal via the “external control” terminal.

You can select three signal-processing methods:

- 0 - 20 mA: at 0 mA the S2Ca does not operate
  at 20 mA the S2Ca operates at 180 strokes/min.
  Between these two extremes the stroke rate is proportional to the electrical signal.



- 4 - 20 mA: at 4 mA the S2Ca does not operate
  at 20 mA the S2Ca operates at 180 strokes/min.
  Between these two extremes the stroke rate is proportional to the electrical signal.
  For signals of below 3.8 mA a fault will be detected and the S2Ca will stop (e.g. cable break).
- Curve: In the “curve” processing mode you can programme the S2Ca ratios.
  There are 3 options available:
  - ----- = straight line
  - --__ = lower band
  - __/-- = upper band



Straight line:

The following symbol appears in the LCD display: ----- .
You can enter any stroke frequency ratio for the S2Ca in proportion to the electrical signal.
You must enter two points P1 (I1, F1) and P2 (I2, F2). F1 is the stroke rate at which the pump should operate at current I1: the straight line and the ratio are fixed accordingly:

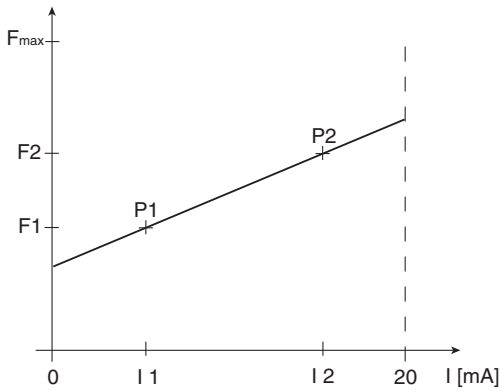


Fig. 19

NOTE

Draw a diagram like the one above - with values for (I1, F1) and (I2, F2) - in order to set the S2Ca to your required stroke rate!

Lower/upper band:

This processing mode allows you to control a pump via an electrical signal as shown in the diagrams below.

Lower band

e.g. Alkali pump

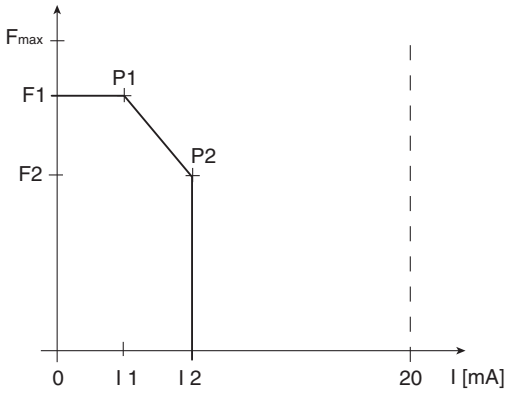


Fig. 20

Upper band

e.g. acid pump

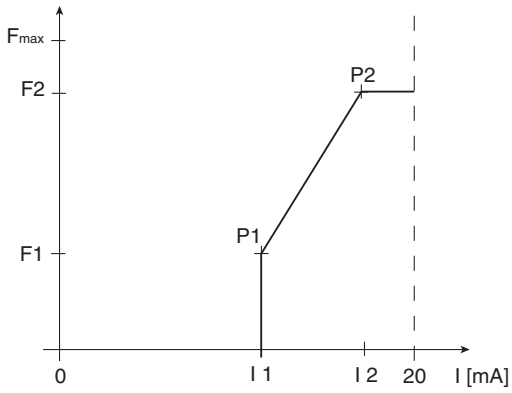


Fig. 21

Lower band:

The symbol appears in the LCD display. The S2Ca will operate below I1 at F1. Above I2, the S2Ca ceases to operate. Between I1 and I2 the stroke rate is between F1 and F2, proportional to the signal current.

Upper band:

The signal appears in the LCD display. The S2Ca will cease to operate below I1. Above I2, the S2Ca will operate at F2. Between I1 and I2 the stroke rate between is F1 and F2, proportional to the signal current.

The smallest processable difference between I1 and I2 is 4 mA.

Error processing

In the “ER” (error) menu option you can activate an error processing function for the “curve” mode. An error message appears for signals below 3.8 mA and the S2Ca stops.

7.4.3 Settings for “contact” operating mode (CONTCT menu)

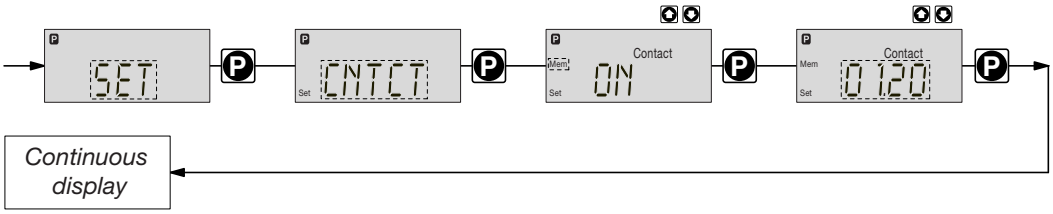
In addition to those settings menus described in 7.5, there is an additional CONTCT in the overall SET menu for the “contact” operating mode.

The operating mode “contact” allows you to activate a single stroke or a series of strokes. The strokes can be activated by a pulse or via the “external control” terminal. This operating mode is intended to transfer input pulses into a reduction (fraction) or small increase in strokes.

IMPORTANT

The factor resets to “1” if you change to a different operating mode.

In the “contact - identity code: external with external pulse control” you can enter the number of pulses after which a stroke should be carried out. “Contact - identity code: external with external pulse control” is intended for small dosing quantities.



The number of strokes per pulse depends upon the factor, which you can enter. This allows you to vary to a certain extent the input pulses by a factor of 1.01 to 99.99 and/or reduce by a factor of 0.01 to 0.99:

“Number of strokes activated = factor x number of input pulses”

Examples

	Factor	Pulse (sequential)	Stroke number (sequential)
Increase	1	1	1
	2	1	2
	25	1	25
	99.99	1	99.99
	1.50	1	1.5 (1 / 2)
	1.25	1	1.25 (1 / 1 / 1 / 2)
Reduction	1	1	1
	0.50	2	1
	0.10	10	1
	0.01	100	1
	0.25	4	1
	0.40	2.5 (3 / 2)	(1 / 1)
	0.75	1.33 (2 / 1 / 1)	(1 / 1 / 1)

Explanation of increase

At a factor of 1	For every 1 pulse, 1 stroke is activated
At a factor of 2	For every 1 pulse, 2 strokes are activated
At a factor of 25	For every 1 pulse, 25 strokes are activated

Explanation of decrease

At a factor of 1	After 1 pulse, 1 stroke is activated
At a factor of 0.5	After 2 pulses, 1 stroke is activated
At a factor of 0.1	After 10 pulses, 1 stroke is activated
At a factor of 0.75	After 2 pulses, 1 stroke is activated, then after 1 pulse, 1 stroke is activated, then after 2 pulses, 1 stroke is activated etc.

NOTE

If a remainder occurs when the factor is processed, the S2Ca counts up the remainder values. When the sum reaches or exceeds “1” the S2Ca will activate a stroke. This ensures that the stroke number corresponds exactly to the factor throughout the dosing operation.

The number of input pulses which have not been processed are stored by the S2Ca in the stroke memory. The stroke buffer is limited to the batch size when memory is not activated (- with “Memory” at 65535 stokes). You can delete it by switching to a different operating mode.

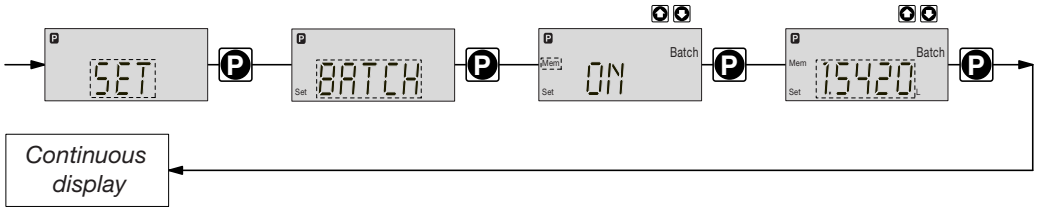
You can optimally adapt the S2Ca to the respective process, e.g. in connection with contact water meters.

“Memory” extension function

The “memory” extension function can be optionally activated (“mem” appears in the LCD display). When “Memory” is activated the S2Ca adds any strokes which could not be carried out up to the maximum capacity of the stroke buffer – 65535 strokes. If this maximum capacity is exceeded the pump will register a fault.

7.4.4 Settings for “batch” operating mode (BATCH menu)

In addition to those settings menus described in 7.5, there is an additional BATCH menu in the overall SET menu for the “batch” operating mode.



The “batch” operating mode is a variant of the “contact” operating mode (see 7.4.3).
You can pre-select a stroke number (no breaks, whole numbers only from 1 to 65535) as well as a feed quantity (batch). To switch between entries for “stroke number” and “feed quantity” press the i key 1x in the corresponding menu option (see also overview “operating/settings diagram”, fold-out page).
The “batch” operating mode is intended for large dosing quantities.

Metering can be actuated by pressing the P-key or via a pulse from the “external control socket”.

The number of input pulses which have not been processed are stored by the S2Ca in the stroke memory. The stroke buffer is limited to the batch size when memory is not activated (- with “Memory” at 65535 stokes). You can delete it by switching to a different operating mode.

“Memory” extension function

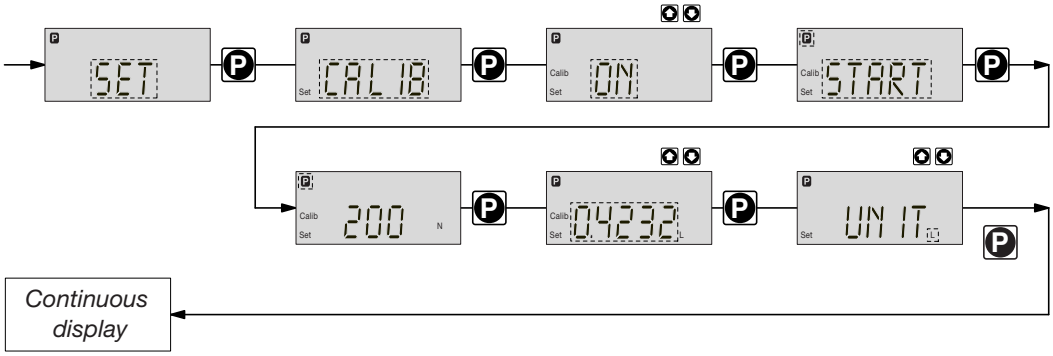
The “memory” extension function can be optionally activated (“mem” appears in the LCD display). When “Memory” is activated the S2Ca adds any strokes which could not be carried out up to the maximum capacity of the stroke buffer – 65535 strokes. If this maximum capacity is exceeded the pump will register a fault.

7.5 Settings for programmable functions (SET menu)

The following programmable function settings menus appear in all operating modes:

- Calibrate (CALIB menu)
- Auxiliary frequency (AUX menu)
- Flow (FLOW menu, available only if flow monitor is connected)

7.5.1 Settings for “calibration” function (CALIB menu)



The S2Ca can also run in calibration mode. The corresponding continuous displays show the current dosing quantities or the feed rate.

The calibration is retained in the event of a change of the set stroke length by up to ±10 scale rates percent (if the stroke length is set to 40 % the range is 30 % to 50 %). If the stroke length is changed by more than ±10 scale rates percent the yellow warning light lights up, the permanent display flashes and the flashing “Calib” indicator appears.

NOTE

- **Do not go below 30 % stroke length (SEK type: 50 %).
  This will significantly affect accuracy of calibration.**
- **Calibration becomes increasingly accurate the more strokes made by the S2Ca during calibration (recommended: at least 200 strokes).**

WARNING

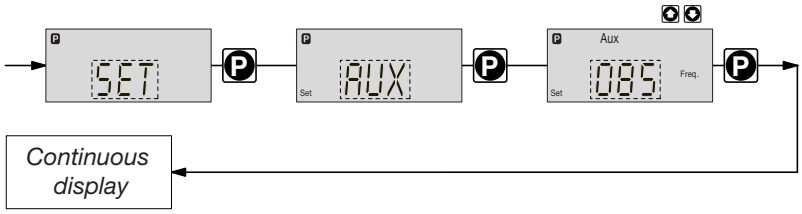
If using a hazardous feed chemical, the following setting instructions ensure adequate safety precautions are taken!

Calibration

- ▶ Insert the suction tube into a measuring cylinder containing the feed chemical - the discharge tubing must also be correctly installed (operating pressure,…!)
- ▶ Suck up the feed chemical (press both arrow keys at the same time) when the suction tube is empty
- ▶ Note the liquid level in the measuring cylinder and the stroke length
- ▶ Select the CALIB menu and go the first menu option using the P key
- ▶ Select “ON” using an arrow key and change to the next menu option using the P key
- ▶ To commence calibration, press the P key. The S2Ca starts to pump and displays the number of strokes (“STOP” appears at regular intervals)
- ▶ After a sufficient number of strokes, stop the S2Ca with the P key
- ▶ Calculate the dosed quantity (difference between the original quantity and the quantity remaining)
- ▶ Enter this quantity in the next menu option and then change to the following menu option by pressing the P key.
- ▶ Select the unit (“L” or “gal”) in the “UNIT” menu with an arrow key and push the P-button.

The S2Ca is calibrated.
The corresponding continuous displays show the calibrated values.
The total stroke number and total litres are set during calibration to “0”.
The S2Ca is in the STOP status.

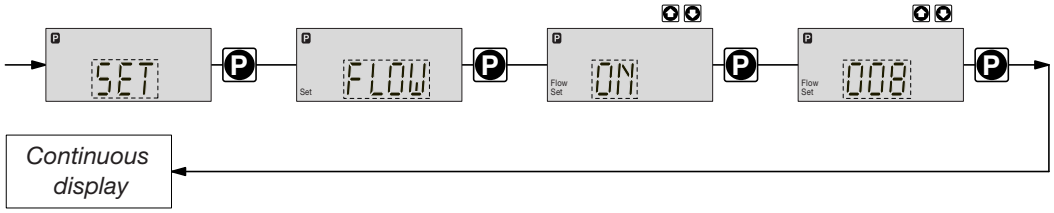
7.5.2 Settings for “auxiliary frequency” function (AUX menu)



The programmable function “auxiliary frequency” allows switching to a different stroke frequency, which can be set in the AUX menu. It can be activated via the “external control” terminal. When the auxiliary frequency is activated, “aux” appears in the LCD display.

This auxiliary frequency overrides the current stroke frequency set for the selected operating mode.

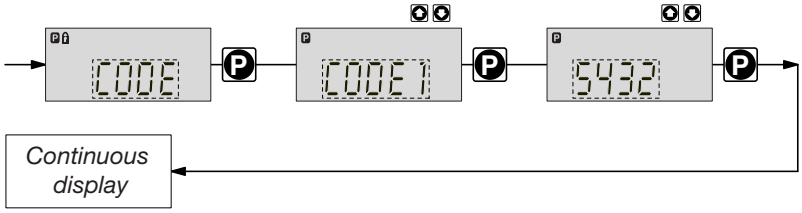
7.5.3 Settings for the “flow” function (FLOW menu)



The flow menu only appears when a dosing monitor is connected to the “dosing monitor” terminal. This dosing monitor registers each discharge stroke of the S2Ca at the discharge connector and transmits it back to the S2Ca. If this response transmission is serially omitted for a period set in the FLOW menu (due to failure or below-minimum dosing) the S2Ca stops.

7.6 Setting code (CODE menu)

The code menu is used to select whether you want to prevent access to parts of the settings options.



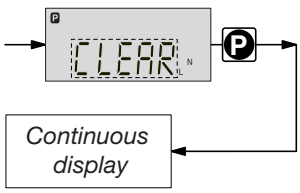
In the first menu option you can choose CODE 1 or CODE 2 (both use the same number).

- Select CODE 1 to prevent access to the settings mode (① in the overview “operating/settings diagram”, fold-out page). In the next menu option, enter the number you wish to use as the code.
- Select CODE 2 to prevent access to the settings options for directly alterable values in the continuous displays (② in the overview “operating/settings diagram”, fold-out page). In the next menu option, enter the number you wish to use as the code.
- Select NONE to remove a pre-set security lock.

7.7 Cancel total stroke number or total litres (CLEAR window)

In the CLEAR window you can delete the stored total stroke number and simultaneously the total litres (= set to “0”). You may then press the P key briefly to exit this window.

The values displayed are counted incrementally from the point of commissioning the pump, or from the last delete action.



8 Operating

This section describes all operating options available to you when the S2Ca is in continuous display mode (no P key symbol in the LCD display).

WARNING

- **For all metering pumps for metering inflammable media applies: Starting up and emptying only supervised by a competent person.**

NOTE

- **Open out the fold-out page following the title page fully! There you will find the overviews "control elements and key functions" and "operating/settings diagram".**
- **Look at the overview "continuous displays". This page shows you which displays are available in which operating mode, and which values are directly alterable in the corresponding continuous displays.**

8.1 Manual operation

Set stroke length

Stroke length is continually adjustable within a range of 0-100 %. The recommended stroke length range, which will practically guarantee technical reproducibility, is 30-100 % (SEK type: 50-100 %).

NOTE

At low stroking rates (less than 1/3 maximum stroking rate) the controller switches to digital stroking mode. This ensures adequate cooling of the motor at low stroking rates.

The following operating options are available via the different keys (see also figure on the next page):

Stop/Start S2Ca

To stop S2Ca: press STOP/START key.
To start S2Ca: press STOP/START key.

Start batch

Press the P key briefly in "batch" operating mode.

Load factory settings

Press the P key for 15 s to load factory calibration settings!
Current settings will be deleted.

Change to settings mode

When you press the P key for 2 s in any continuous display the S2Ca will change to settings mode (see section 7).
If CODE 1 is set, the code must be entered after pressing the P key.

Check adjustable values

Each time you press the i key you will see a different continuous display. The number of continuous displays depends upon the identity code, the selected operating mode and the connected accessories.

Change directly alterable values

To change a value (see below) directly in the corresponding continuous display, press one of the arrow keys until "set" appears in the LCD display. The delay has been programmed in to prevent inadvertent changing of values.

If CODE 2 has been set, this code must be entered after pressing the arrow key.

Directly alterable values are as follows:

Stroke rate

In "manual", "contact" and "batch" operating modes:
The stroke rate can be altered in the "stroke rate" display.

Feed rate

In "manual" operating mode
The feed rate can be altered in the "feed rate" display.

Factor

The factor is the number of strokes activated by an external pulse or a press of the P key (in "batch" mode only).

In "Batch" operating mode:
You can alter the factor from the "remaining strokes" display.
The S2Ca returns to the original continuous display a few seconds after the factor has been reset.

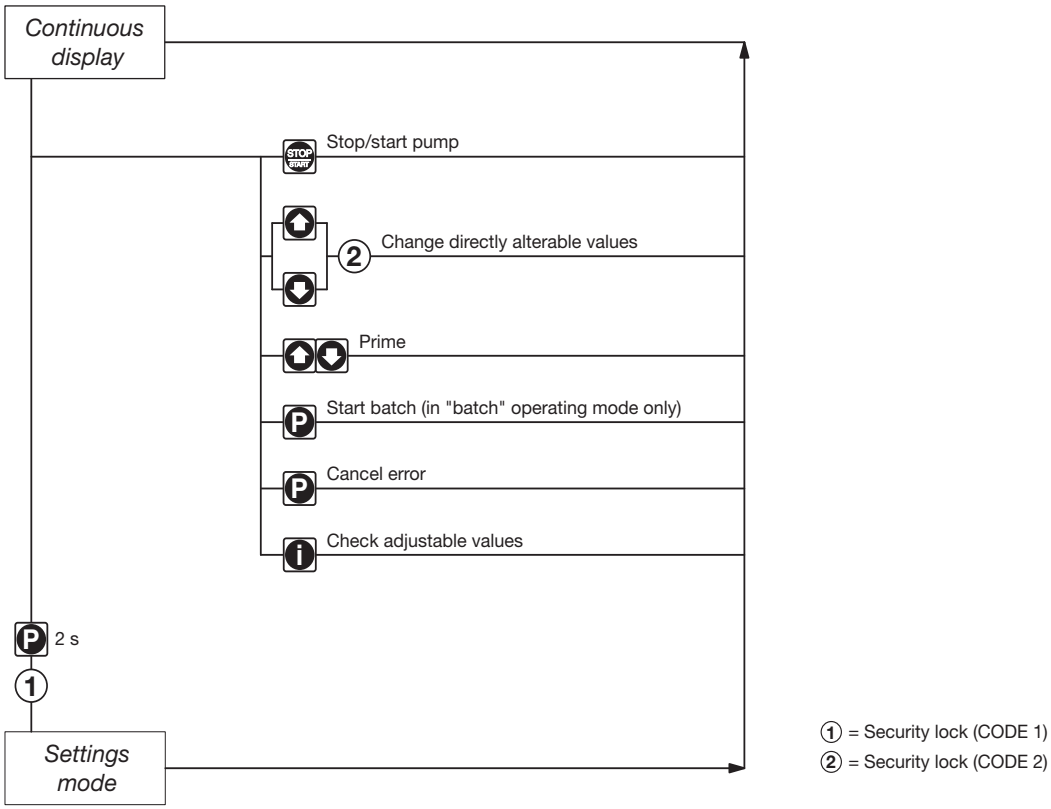
Display program version

Press the P key for 10 seconds to display the program version.
Example: "V1052" + "X1010".
In the case of "LOAD3" release the key immediately!

Batch size In “batch” operating mode:
The batch size can by changed from the “batch size/remaining litres” display.
The S3Ca returns to the original continuous display a few seconds after the batch size has been reset.

Priming The “priming” function is activated by pressing both arrow keys at the same time (in “Stroke rate” permanent display).

Cancel error Error messages are cancelled by pressing the P key briefly.



8.2 Remote control

Remote control of the S2Ca is possible via a control cable or PROFIBUS® (see Section 5.3 and Chapter 7, ”Supplementary instructions for ProMinent® gamma/ L and ProMinent® Sigma versions with PROFIBUS®“ as well as your documentation in the annex).

9 Troubleshooting

WARNING

- **EX-pump only: metering pumps and their peripheral equipment must be serviced by specially trained or authorised personnel!**
- **Always take suitable precautions when using hazardous chemicals!**
- **Ensure the equipment is de-pressurised before working on the pump!**

Pump primes despite completed stroke action and no venting

Cause Crystalline deposits on the ball seat because valves have dried out.

Remedy
- ▶ Remove the suction sleeve from the chemical supply container and rinse out the liquid end thoroughly.
- ▶ If still unsuccessful, dismantle valves and clean.

Fluid is seeping from the top plate

Cause The liquid end is not sealed against the pump diaphragm.

Remedy
- ▶ Tighten screws in the liquid end.
- ▶ If unsuccessful, replace the diaphragm (see section 4.3).

Green LED indicator (operating display) is not lit

Cause Incorrect or no mains voltage.

Remedy
- ▶ Use the recommended mains voltage as given in the voltage specification on the nameplate.

Error Messages

Red LED display is lit, “Error” and “MINIM” flash in the display

Cause Fluid level in the chemical storage tank has reached “liquid level low, stage 2”.

Remedy
- ▶ Fill the chemical supply container.

Red LED display is lit, “Error” and “ANALG” flash in the display

Cause S2Ca is in “analogue” operating mode, a fault routine has been programmed in the ANALG menu and the operating current has fallen below 3.8 mA.

Remedy
- ▶ Remedy low operating current.
- ▶ Switch fault routine “OFF” (see section 7.4.2.).

Red LED display is lit, “Error” and “CNTCT” flash in the display

Cause S2Ca is in “contact” or “batch” operating mode and the extended function “memory” has been set.
In addition a very large factor has been entered, too many contacts have been input or the P-key has been pressed too often, resulting in an overflow of the stroke memory.

Remedy
- ▶ Press the P-key, saved data will be deleted.
- ▶ Change S2Ca set up.

Red LED display is lit, “Error” and “FLOW” flash in the display

Cause Dosing monitor not properly connected.

Remedy
- ▶ Connect dosing monitor properly.
- ▶ Press P-key.

Cause Dosing monitor has reported more defective strokes than have been set in the FLOW menu.

Remedy
- ▶ Press P-key.
- ▶ Investigate the cause and remedy.

Red LED is lit. “Error” appears in the display and “MOTOR” is flashing

Cause The motor is not operating accurately because the backpressure is too high.

Remedy
- ▶ Reduce backpressure.
- ▶ Press the P key (reset key).

Cause The motor is overheating.

Remedy
- ▶ Check ambient temperature (max. 40 °C).
- ▶ Allow motor to cool down.
- ▶ Press the P key (reset key).

Cause Other motor fault.

Remedy
- ▶ Call ProMinent.
- ▶ Press the P key (reset key).

Red LED is lit. “Error” appears in the display and “TEMPERATURE” is flashing

Cause The temperature in the pump housing is too high because the ambient temperature is too high.

Remedy
- ▶ Reduce ambient temperature.
- ▶ Allow motor to cool down.
- ▶ Press the P key (reset key).

Cause The temperature in the pump housing is too high because the pump is consuming too much power.

Remedy
- ▶ Check installation, rectify if necessary.
- ▶ Allow motor to cool down.
- ▶ Press the P key (reset key).

Red LED display is lit, “Error” appears in the display and “FAN” is flashing

Cause Fault related to fan in pump housing.

Remedy
- ▶ Check fan and replace if necessary.
- ▶ Press the P key (reset function).

Red LED display is lit, “Error” appears in the display and “SYSTEM” is flashing

Cause Controller fault.

Remedy
- ▶ Disconnect the pump from the mains and reconnect.
  If the error message continues, send the pump back to ProMinent.

Red LED lights up, “Error” appears in the display and “Menu” flashes.

Cause Stroke buffer full

Remedy
- ▶ Rectify fault
- ▶ Press P key (Make a note of what effect this has on your process).

All other Errors

Please contact your ProMinent branch or representative!

Fault Signals

Yellow LED display is lit

Cause Liquid level in chemical storage tank has reached “liquid level low, stage 1”.

Remedy
- ▶ Fill chemical storage tank.

Yellow LED Display is lit and “calib” flashes

Cause The pump is calibrated and the stroke length deviates by more than ±10 % from the value at the time of calibration.

Remedy
- ▶ Reset the stroke length or calibrate the pump again to the desired stroke length.

10 Decommissioning and disposal

Decommissioning

WARNING

- **EX-pump only: metering pumps and their periphery must be maintained or decommissioned by qualified or authorised personnel!**
- **For all metering pumps for metering inflammable media applies: Starting up and emptying only supervised by a competent person.**
- **When decommissioning the pump, ensure that all dirt and chemicals are cleaned from the housing and particularly the liquid end.**
- **Always take suitable precautions when using hazardous chemicals!**
- **Ensure that the equipment is de-pressurised!**

- ▶ Disconnect the pump from the mains.
- ▶ Empty the liquid end by placing the pump on its head and allowing the chemical to drain out.
- ▶ Rinse the liquid end with a suitable material, thoroughly rinse the liquid end after use with hazardous materials!

If decommissioning is only temporary, maintain the correct storage conditions:

Storage temperature: -10 to +50 °C

Air humidity: < 92 % relative humidity

Disposal

WARNING

Spring under tension!

Take particular care when disassembling the pump as the return spring (Item 5, Chapter 2.2) is under considerable mechanical tension!

IMPORTANT

Observe your locally applicable regulations (particularly with regard to electronic scrap and gear oil)!

11 Spare parts and accessories

CAUTION

The assembly and installation of ProMinent® metering pumps with other-make parts that are not tested and recommended by ProMinent are not permitted and can lead to personal injury and damage to property for which no liability shall be accepted!

Spare parts
You will find the order numbers for the wearing parts in the exploded view drawings in the annex. If you require further parts, please order the "Spare parts list ProMinent® Sigma/ 2".

Actuator for automatic stroke adjustment, setting time approx. 1 sec for 1% stroke length, feedback potentiometer 1k Ohm enclosure rating IP 54.

Adjuster comprising actuator and incorporating servo controller for stroke length adjustment via standard signal. Standard signal input 0/4-20 mA, corresponds to stroke length 0 – 100 %. Manual to automatic mode switch, switch for stroke length adjustment in manual mode, mechanical position display of 0/4-20 mA actual stroke length value output for remote display.

Variable speed motors with integrated speed changer (Identcode characteristic V)
Power supply 1 ph 230 V, 50/60 Hz, 0.37 kW
Optional external control via 0/4-20 mA

Speed controllers in metal casing (Identcode characteristic Z)
The speed controller kit comprises a speed changer and a 0.37 kW variable speed motor.

Float switches
2-stage, with 2 m connection cable

Alarm relays
For signalling faults

Alarm and pacing relays
For cyclic timing of other devices and for signalling faults.

Control cables
Universal control cable 5-core/2.5 and 10 m
External contact cable 2-core/2.5 and 10 m

Foot valves
With intake filter and non-return ball for connection at end of intake line.

Metering valves
With spring-loaded non-return ball for metering in open or closed systems and for mounting the metering line.

Backpressure valves
For exact metering at low operating pressure or as overflow safety valve.

Accumulators
For pulsation damping in long metering lines.

Metering monitors
For monitoring metering operations. After an adjustable number of non-acknowledged metering strokes, a fault is indicated and the metering pump shut down.

Intake assemblies
With foot valve and float switch for expendable packing drums or metering tanks.

Metering tanks
From 35 to 1000 l capacity with lockable screw cover and necessary accessories.

Manual/electric stirrers
For mixing and preparing metering solutions.

Motor Datenblatt / Motor data sheet / Fiche technique pour moteur

Bestell Nr. **order no. / no. de commande**	**1011036**	**Hersteller** **producer / producteur**	**ATB**

Motor-Typ motor type type du moteur	AF 63/4C-7	**Leistungsfaktor** power factor facteur de puissance	0,66	
Maschinenart type of machine désignation	3-Ph. Motor	**Wirkungsgrad** efficiency rendement	%	
Schutzart degree of protection degré de protection	IP55	**Bemessungsfrequenz** rated frequency fréquence nominale	50 Hz	
Bauform mounting construction	IMB5	**Bemessungsdrehzahl** rated speed vitesse nominale	1370	U/min rpm t/mn
Bemessungsleistung rated output puissance nominale	0,25 kW	**Wärmeklasse** temperature class class d'isolement	F	
Bemessungsspannung rated voltage tension nominale	⅄ / Δ 400/230 V	**Anzugsstrom** starting current courant de démarrage	3,2	fach fold fois
Bemessungsstrom rated current courant nominale	0,94/1,62 A	**Anzugsmoment** starting torque couple de démarrge	2,1	fach fold fois
Geprüft nach tested in acc. with contrôlé selon	DIN EN 60034	**Kippmoment** pull-out torque couple de décrochage	2,3	fach fold fois
PTB Nr.	ohne EX-Schutz without EX-protection	**Umgebungstemperatur** ambient temperature température ambiante	max. 40 °C	
		Schaltung connection branchement	⅄ / Δ	
Anmerkung comments observation	400/230 V 380-420/220-240 V (50 Hz)			
ProMinent Pumpentyp	S2Ca HM _ _ T _ _ _ _ U _ _ _ _ _ _			

Motor datasheets are available for further information.
Special motors and special motor flanges are possible on request.

For pumps without Ex protection:

EC Declaration of Conformity

We,

ProMinent Dosiertechnik GmbH
Im Schuhmachergewann 5 - 11
D - 69123 Heidelberg

hereby declare that, on the basis of its functional concept and design and in the version brought into circulation by us, the product specified in the following complies with the relevant, fundamental safety and health stipulations laid down by EC regulations.
Any modification to the product not approved by us will invalidate this declaration.

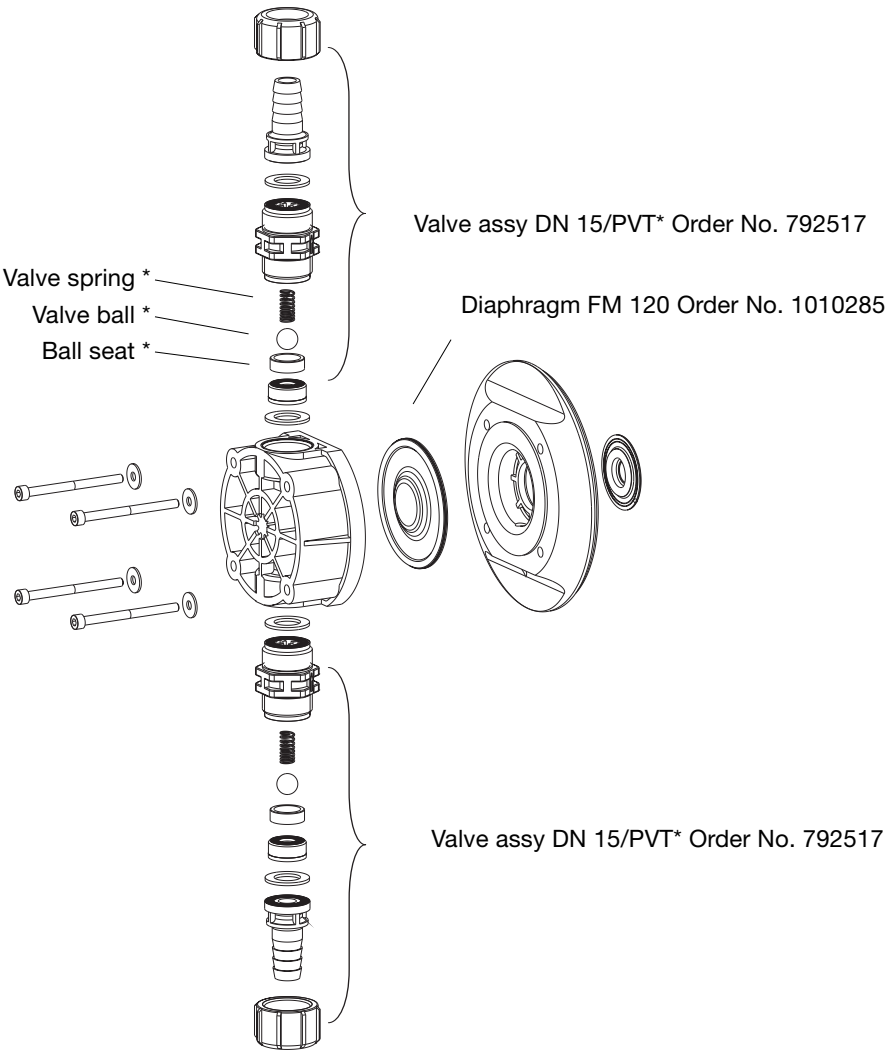
Product description :	*Metering pump, series Sigma*
Product type :	*S2Ba.../ S2Ca...*
Serial number :	*see type identification plate on device*
Relevant EC regulations :	*EC - machine regulation (98/37/EC)* *EC - low voltage regulation (73/23/EEC)* *EC - EMC - regulation (89/336/EEC subsequently 92/31/EEC)*
Harmonised standards used, in particular :	*DIN EN 292-1, DIN EN 292-2, DIN EN 809,* *DIN EN 600335-1, DIN EN 60335-2-41,* *DIN EN 61010, 60204-1, DIN EN 60034-5, DIN EN 60529* *DIN EN IEC 61000-3-2, 61000-3-3, 61000-6-2, DIN EN 61800-3* *DIN EN 50081-1/2, DIN EN 50082-1, DIN EN 55014-1/2*
National standards and other technical specifications used, in particular :	*DIN VDE 0530 T1/T5/T7/T18* *IEC 60034-1/5/7/18, IEC 38*
Date/manufacturer´s signature :	*June 4, 2002*
The undersigned :	*Dr. Rainer V. Dulger, Executive Vice President R&D and Production*

For pumps with Ex protection:

the EC conformity declaration for the pump for explosion-threatened workplaces is supplied with the pump.

The EC conformity declarations, the EC series prototype test reports and the operating manuals for the individual components are also supplied with the pump.

Delivery unit Sigma/ 2 350-DN 25 PVT for identity code types: S2Ba/S2Ca 04350, 07120, 07220
Delivery unit Sigma/ 2 130-DN 15 PVT for identity code types: S2Ba/S2Ca 12050, 12090, 12130


Valve assy DN 15/PVT* Order No. 792517
Valve spring *
Valve ball *
Ball seat *
Diaphragm FM 120 Order No. 1010285
Valve assy DN 15/PVT* Order No. 792517

Spare parts kit FM 350 PVT Order No. 740325
Spare parts kit FM 130 PVT Order No. 740324

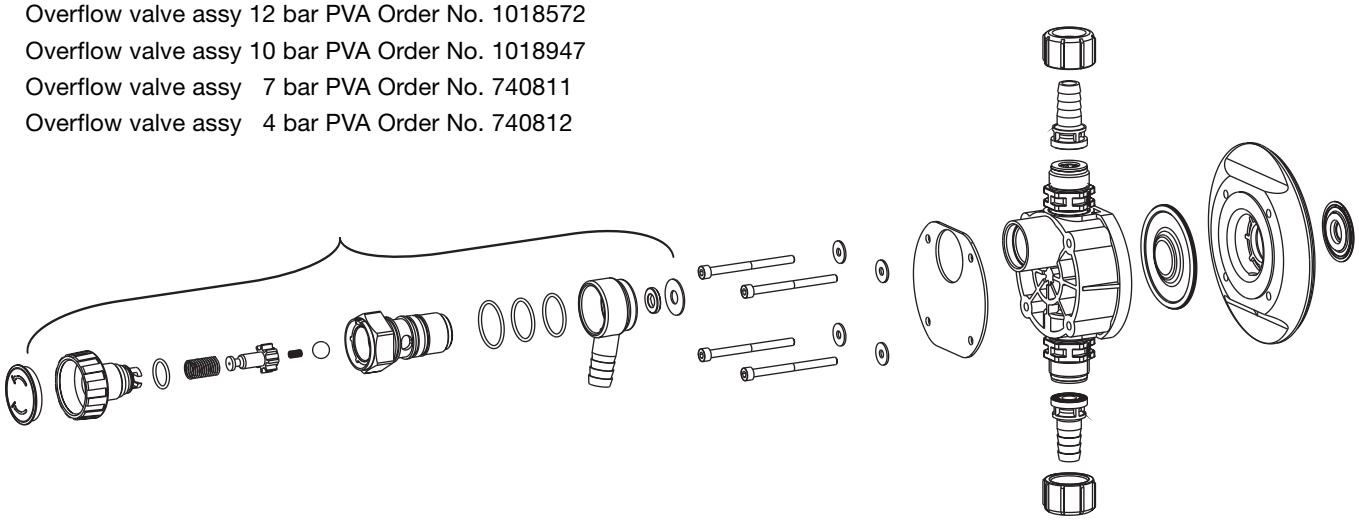
* The listed items are constituent parts of the spare part kit.

** Special accessories (not included in spare part kit).
Subject to technical modifications.

Fig. 22
61_05-104_00_99-03

Delivery unit Sigma/ 2 350-DN 25 PVT for identity code types: S2Ba/S2Ca 04350, 07120, 07220
Delivery unit Sigma/ 2 130-DN 15 PVT for identity code types: S2Ba/S2Ca 12050, 12090, 12130

Overflow valve assy 12 bar PVA Order No. 1018572
Overflow valve assy 10 bar PVA Order No. 1018947
Overflow valve assy 7 bar PVA Order No. 740811
Overflow valve assy 4 bar PVA Order No. 740812

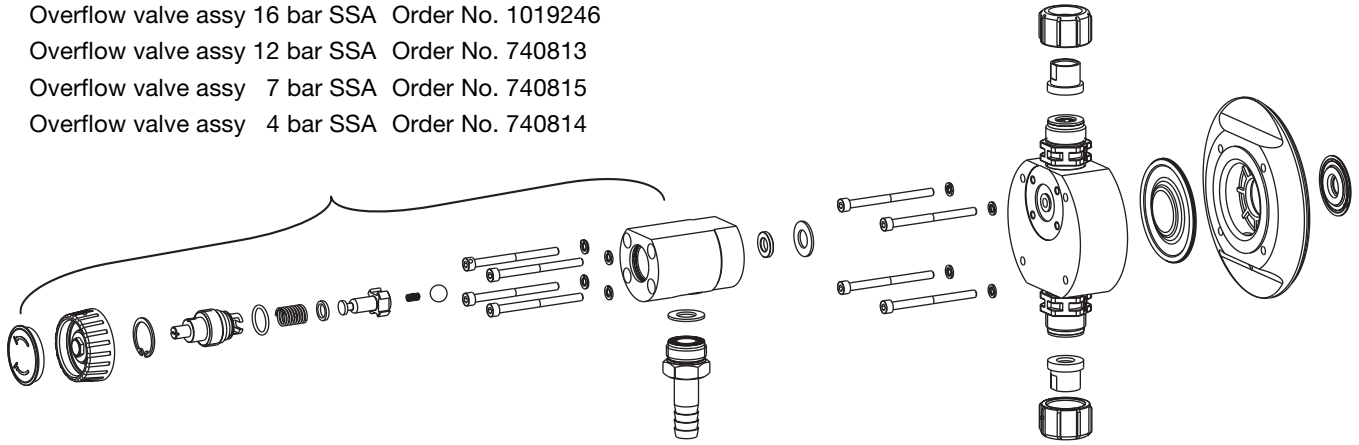


For other spare parts see delivery unit without overflow valve (see P. 56).
Subject to technical modifications.

Fig. 23
61_05-104_01_00-03

Delivery unit Sigma/ 2 350-DN 25 SST for identity code types: S2Ba/S2Ca 04350, 07120, 07220
Delivery unit Sigma/ 2 130-DN 15 SST for identity code types: S2Ba/S2Ca 12050, 12090, 12130, 16050, 16090, 16130

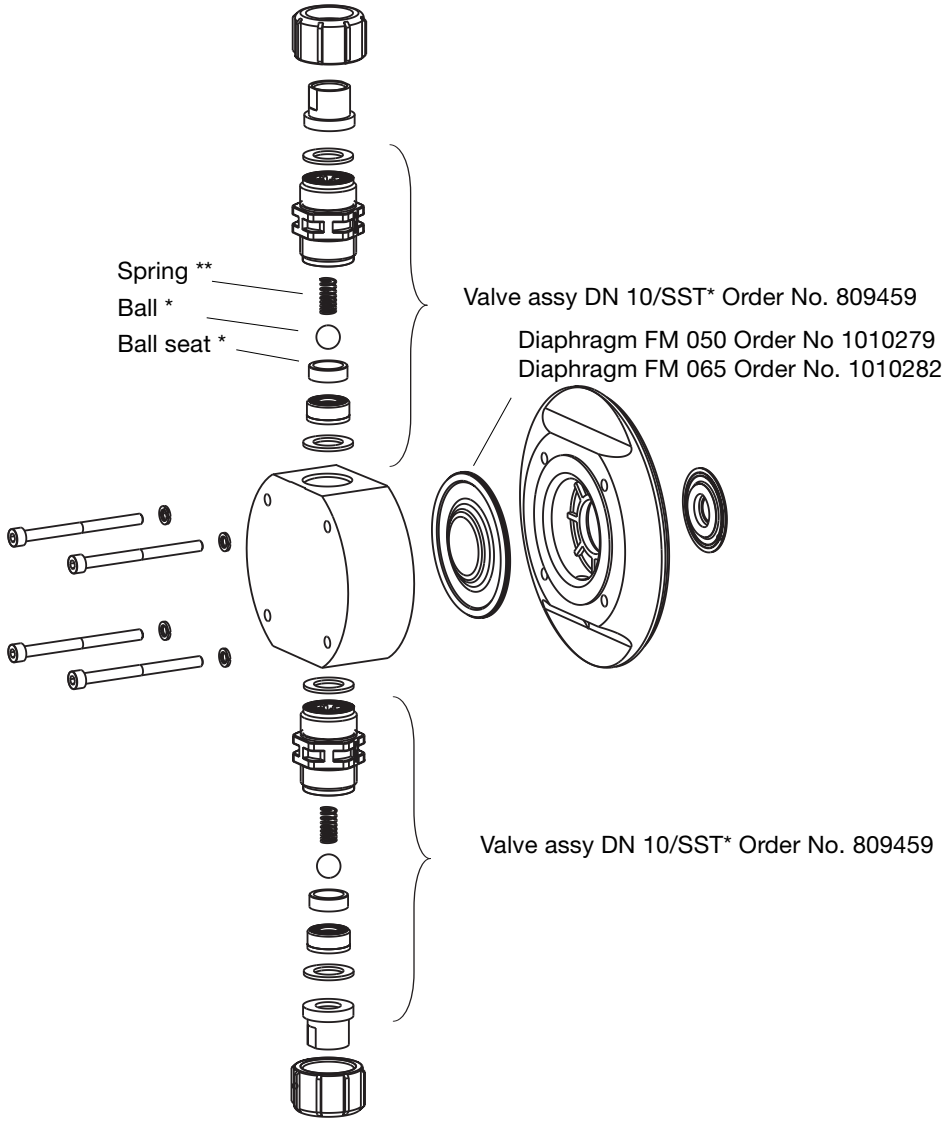
Overflow valve assy 16 bar SSA Order No. 1019246
Overflow valve assy 12 bar SSA Order No. 740813
Overflow valve assy 7 bar SSA Order No. 740815
Overflow valve assy 4 bar SSA Order No. 740814



For other spare parts see delivery unit without overflow valve (see P. 58).
Subject to technical modifications.

Fig. 24
61_05-104_01_01-03_2

Delivery unit Sigma/ 2 350-DN 25 SST for identity code types: S2Ba/S2Ca 04350, 07120, 07220
Delivery unit Sigma/ 2 130-DN 15 SST for identity code types: S2Ba/S2Ca 12050, 12090, 12130


Spring **
Ball *
Ball seat *
Valve assy DN 10/SST* Order No. 809459
Diaphragm FM 050 Order No 1010279
Diaphragm FM 065 Order No. 1010282
Valve assy DN 10/SST* Order No. 809459

Spare parts kit FM 350 SST without valve Order No. 740327
Spare parts kit FM 350 SST with 2 valves Order No. 740329
Spare parts kit FM 130 SST without valve Order No. 740326
Spare parts kit FM 130 SST with 2 valves Order No. 740328

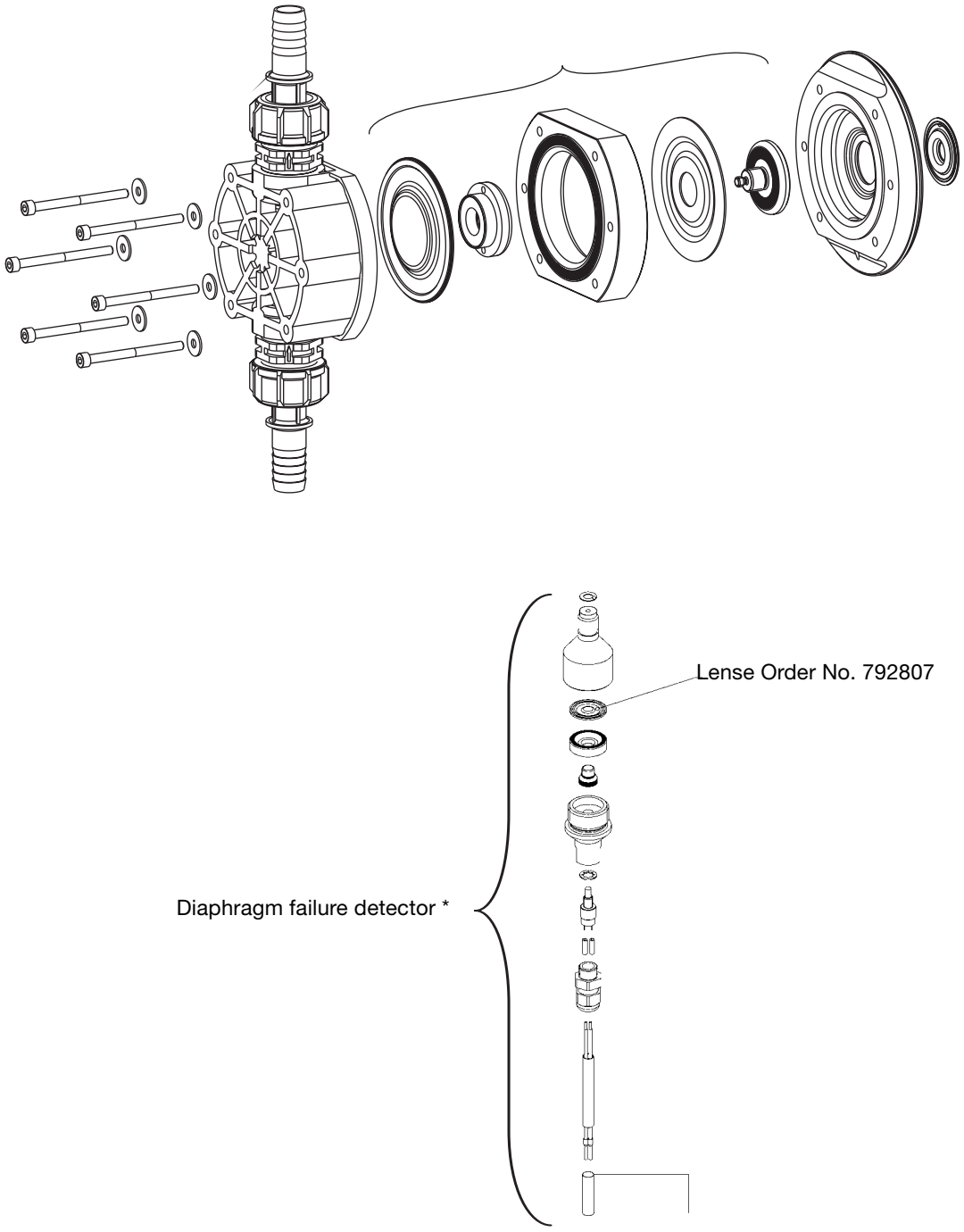
* The listed items are constituent parts of the spare parts kit.

** Special accessories (not included in spare parts kit).
Subject to technical modifications.

Fig. 25
61_05-104_01_01-03_2_norm

Retrofit kit double diaphragm S2Ba/S2Ca

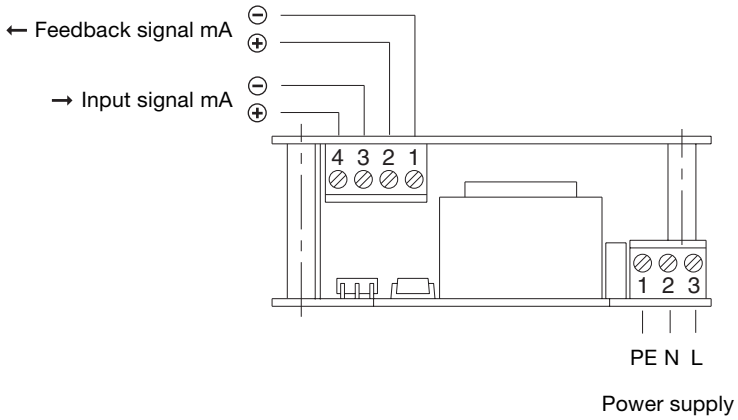
S1Ba Retrofit kit double diaphragm FM 050 Order No. 1009846
S1Ba Retrofit kit double diaphragm FM 065 Order No. 1009848
S1Ba Retrofit kit double diaphragm FM 120 Order No. 1009850
S1Ca Retrofit kit double diaphragm FM 050 Order No. 1009847
S1Ca Retrofit kit double diaphragm FM 065 Order No. 1009849
S1Ca Retrofit kit double diaphragm FM 120 Order No. 1009851



* These items belong to the retrofit kit.
Subject to technical modifications.

Fig. 26
61_05-104_00_98-03_2

Stroke actuator wiring diagram



Wiring diagram for stroke length adjuster